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SYLVIA AUGUSTA DUBRULE

Date of Birth — Date de naissance

2 AUGUST, 1936

Country of Birth — Lieu de naissance

ENGLAND

Permanent Address — Résidence fixe

46 MANOR DRIVE
SHERWOOD PARK
ALBERTA
T8A 0S4

Title of Thesis — Titre de la thèse

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Name of Supervisor — Nom du directeur de thèse

S. BERTRAM, Ph. D.

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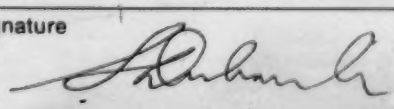

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by

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A THESIS

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IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

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46, Manor Drive,
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Supervisor

Date June 23, 1982

Abstract.

A brief history of communications is followed by a more detailed review of the history of the computer. Recent developments in both areas are noted. Some applications of the new technologies and their potential influence on libraries are discussed. Factors either inhibiting or encouraging acceptance of the new technologies, and the effects of these on libraries and their patrons are considered. The last chapters review present and possible future influences of the new technologies on books by mail libraries, with specific application to the Extension Library at the University of Alberta.

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I. Preface

Purpose of the Thesis

This study is an attempt to investigate the present and possible future effects of the new technologies on libraries, particularly those offering books by mail services, and on their clienteles. The need for the study grew out of the fact that, as Librarian to the Extension Library at the University of Alberta, I felt a need for a better understanding of the new developments in the areas of computers and communications, in order to feel assured of giving appropriate direction to the library.

The Literature Search

Neither the study nor the bibliography is comprehensive. The thesis ranges over such a vast area of information that it was not possible to cover all aspects of all subjects discussed.

The literature search included non-technical materials published in 1978, or later, which were related to information science or to the effects of technological changes on libraries and librarianship. Relevant materials related to sociological and educational trends were included, regardless of date of publication. Materials describing books by mail libraries were found to be particularly sparse and, as a consequence, this section of the study is briefer than originally intended.

The search for materials was limited to those directly available from the University of Alberta libraries, the County of Strathcona Public Library and local bookstores. This applies to both books and periodicals. This approach is defensible in light of the breadth of the study, the need for the latest information concerning technological trends and the fact that the need for esoteric materials did not arise. As recent materials were often known to be available before they appeared on library shelves, purchase was occasionally necessary.

Methodology

Materials were found through the catalogues and indexes of the libraries mentioned above. Particularly fruitful headings were: 'telecommunications' 'technological innovation,' 'communications,' and 'information science' in the library related indexes (*Library and Information Science Abstracts* and *Library Literature*). The *Readers' Guide to Periodical Literature* and the *Canadian Periodical Index* yielded some items under

these headings and also under such headings as 'computers,' 'automation,' etc. However, these latter tended to be too general in their application. Subscriptions to *Discovery,' Bandwidth, Time* and memberships in such organisations as the Canadian Library Association and the American Society for Information Science also proved valuable.

Contents of the Thesis

After a brief history of communications, the study includes a survey of new technological developments related to computers and communication systems and notes some applications of these developments. Some of the sociological factors that contribute to or inhibit acceptance of the new technologies are then reviewed. After applying these findings to library patrons, the study gradually narrows the area of application. The findings are applied to public and academic libraries, then to books by mail libraries and finally, to the Extension Library. In this way, the effects of the new technologies are applied to progressively more specific situations. The study noted that differences between books by mail and other libraries will diminish.

Application of the Thesis

The study is intended to be useful to all librarians, not only those involved with books by mail services. It attempts to build a picture of the present situation and conditions and to extrapolate trends and directions from these, primarily, in order to apply this knowledge for the benefit of the Extension Library. However, it is hoped that the study will be useful to anyone interested in the effects of the new technological developments on any public, academic or books by mail library.

II. A Brief Overview of the History of Communications.

A. Introduction

Today, the Western world teeters on the brink of major changes in its organisation, external relations and internal life style, as a result of the inevitable application of major technological advances to the task of moving and storing information. These advances are occurring so rapidly that nobody can foresee all of their consequences, and both businessmen and professionals are groping for a firm foundation upon which to build. Their need is to set goals and define objectives, both for their institutions and for themselves.

B. Influences Affecting Acceptance of Change

Until the end of the nineteenth century, individual entrepreneurs were responsible for improvements in communications. Although nearly all founded their innovations on others' discoveries and inventions, such individuals as Morse and Bell were able to initiate advances when the need for them became sufficiently urgent. Today, the method of invention is less haphazard. Teams of scientists are deliberately searching for the gaps in the communications process and then applying their knowledge and skills to fill them. As a result of this approach and as a consequence of the pressures generated by the needs of an advanced civilisation, rapid changes can be expected to occur.

Retarding influences may modify the speed of change. Modern 'Luddites' may smash computers, governments may attempt to slow the pace of change for the sake of easing social adjustments and corporations will try to safeguard vested interests. Fear and short-sightedness may also provide temporary barriers. It is certain that change will not be halted, although all of the above factors are likely to bring modifications to policies, anticipated applications and use of the new technologies.

There are numerous pressures within our civilisation which will force these changes to occur. The information explosion, which has long since ceased to be controllable through the methods of the industrial age, demonstrates a constant and urgent need for improved information handling techniques. New technologies are indicating, with increasing vigour, the inefficiency of the assembly line and of mechanical

production methods. Capitalist societies, competing for markets and profits, will not ignore methods that appear to improve efficiency and so give them an advantage over a competitor. In a world facing renewal of the Cold War, instantaneous and fault-proof communications and information are vital.

Brian Winston[1] has suggested that inventions are accepted only when the need for them has been felt. Consequently, today's advances in communications can be expected to find rapid acceptance once corporate and political interests have been, at least, partially met. It is also possible to hypothesise that once the usefulness of an invention has been recognised, it will be disseminated among potential users very quickly. As has been noted by Toffler,[2] the period between the introduction of an invention and its general use has consistently decreased throughout history.

C. Developments in Communications

Many inventions and innovations have had dramatic effects on the societies to which they were introduced but probably, few have affected civilisation's growth and development to the extent that improvements in communications have done.

Writing

Before the invention of writing, isolated cultures, dependent on oral traditions, used rituals and ceremonies to maintain their links with the past and provide aids to the collective memory. Horizons were limited by the bounds imposed by village life and by the knowledge and wisdom of the village elders. Writing breached these boundaries. By progressively externalising information storage, it reduced the importance of memory. Writing slowly transformed the lore of the oral cultures into generally available and testable information. Eventually, it accommodated the cross pollination of ideas and so encouraged the growth of knowledge.

Writing was to have far reaching effects. It enlarged the possibilities for controlling and influencing social relationships and the ability to keep records enabled larger societies to be organised and governed. As Smith notes, writing became a defining

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[1]Brian Winston, *Hardware Software: a Background Guide to the Study of the Mass Media. Book 2: Dangling Conversations* (London: Davis-Poynter, 1974), p. 72.
[2] Alvin Toffler, *Future Shock* (New York: Random House, 1970), p. 28.

instrument of social and psychical change in all the societies that it reached.[3]

Print

The Printing Press

The invention of the printing press demonstrated, for the second time, the far reaching effects of major new developments in communications methods. Although printing had been known in Asia for several centuries, it was not until Gutenberg invented the printing press in Mainz, in approximately 1450, that European culture began to feel its impact.

The invention occurred at a propitious time and is a clear example of a need being realised. The principles involved were known in Europe, long before 1450 but until that time, the catalyst needed to bring them together, in the form of the printing press, did not exist. By the mid-fifteenth century there was a growing demand for more written manuscripts and the scriptoria were no longer able to satisfy the requirements of the market so that the rapid acceptance of the printing press is understandable. By the end of the century, Italy alone had published nearly 5000 titles, and there were approximately 1700 presses in operation throughout Europe.[4]

Before Gutenberg, nearly all education was in the hands of the church. Manuscripts were costly, copying was laborious and sometimes careless. Only rarely was an author able to reach a wide audience during his life time. The printing press shifted control away from the church and returned it to the author. This led to a change of emphasis from the production of manuscripts to that of inexpensive texts which were more exact and legible than their predecessors.

The ability to print in quantity was to precipitate major cultural changes including: the first serious challenges to established religion, the questioning of medieval social values and the great intellectual uprising of the Renaissance.[5] It fore-shadowed the industrial and scientific revolutions and paved the way for democracy.

Improvements to the printing press came slowly. Apart from stereotyping and the development of the flat-bed press, it was not until the mid-nineteenth century that major

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[3] Anthony Smith, *Goodbye Gutenberg: the Newspaper Revolution of the 1980's* (New York: Oxford University Press, 1980), p. 7.
[4] Will Durant, *The Renaissance: a History of Civilisation in Italy From 1304 - 1576 A.D. The Story of Civilisation: Part V* (New York: Simon and Schuster, 1953), p. 315.
[5] Christopher Evans, *Mighty Micro: the Impact of the Computer Revolution* (London: Victor Gollancz, 1979), p. 106.

improvements in speed and efficiency were achieved. Then, the rotary press and linotype were introduced, to be followed in this century, by such improvements as off-set lithography, photo-typesetting and eventually, by computer typesetting.

Newspapers and Periodicals

The development of newspapers and periodicals was a natural outgrowth of the ability to print in quantity but it was not until the mid-nineteenth century that these media became genuinely popular. By that time, the results of the first universal education acts were being felt and in England, the newspaper tax had been abandoned.

The penny press proved that a low priced newspaper, edited to be of interest to ordinary people, could win what amounted to mass circulation and attract advertising. By 1837, the *New York Sun* had a daily circulation of 37,000.[6] Early newspapers were highly sensational but this genre gradually gave way to more responsible reporting. The tradition of emphasis upon the news function was helped, in the United States, by the Civil War and in England, by the conservative influence of the *Times*.

The Need For Publishers to Adopt the New Technologies

Publishers have no choice now but to use the new communications methods if they are to survive. Most major newspapers have already done so. The *Edmonton Journal*, for example, is able to transmit computer typeset, camera ready copy by fibre optic line, from its downtown centre to its presses in East Edmonton. The *Toronto Globe and Mail* transmits its morning edition, to Calgary, via satellite.

The Canadian book publishing industry has been slow to adapt to the new communications era, partly because of its own unique problems and partly because of the high capital costs associated with automation. The mini- and micro- computers' increasing ability to reduce expenditure of time and labour may provide this industry with a new lease on life.

Libraries as an Outgrowth of the Proliferation of Printed Material

Although libraries have existed almost as long as the written word, the proliferation of material resulting from the growth and development of printing and publishing offered new challenges. The increasing quantity of material being published emphasised the need for storage and organisation and for people who were

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[6] W.K. Agee, P.H. Ault and E. Emery, *Introduction to Mass Communications* (New York: Harper and Row, 1976), p. 51.

knowledgeable of the materials. Response to these needs became accepted library responsibilities. Consequently, the nineteenth and early twentieth centuries witnessed strong growth in the development of libraries, in both Europe and North America. Classification of materials, standardisation of description for cataloguing purposes and the acceptance of the need for public access to information became cornerstones of a suddenly invigorated and rapidly growing profession. These responsibilities were to become increasingly onerous, however, as the decades passed.

The Need for Improved Communications

By the mid-nineteenth century, print had broadened the horizons of those who could read and the press had increased the number of forms of printed material available but this increase in printed materials had not radically changed the life-style of the majority of the population. This situation changed as the nineteenth century progressed. The industrial revolution developed a need for rapid communication. Both business and government became increasingly complex as the century wore on. A once passive, isolated rural population was replaced by the 'masses': exploited and loudly complaining, factory workers, who were demanding the franchise and improved working and social conditions. A new middle class was also coming into existence whose stability and economic influence demanded the consideration of both government and industry.

The Postal Service

By the nineteenth century, the need for a means of communicating with others at a distance had become clearly apparent. The first and most obvious solution, was to improve the mail service. Although postal service has existed in various forms throughout the period of recorded history, it was not until the effects of the industrial revolution were beginning to be felt that it came into prominence as a social need. By that time, it was obviously a source of revenue for the treasury, was in dire need of improvement in efficiency and was also an area felt, by governments of the day, to warrant the attention of the censor.

In nineteenth century England, post horses had given way to mail coaches as quantities of mail increased but the service remained useful only to the rich. It was the need for efficiency and public dissatisfaction with the high postage rates (an outgrowth of the Napoleonic wars, which had ended twenty years before) that led Rowland Hill to

promote pre-payment for postal services by means of stamps, and a single rate regardless of the distance carried or the number of sheets of which a letter was composed. Instead, a weight restriction would be used to simplify the pricing procedure.

Hill's reforms, introduced in 1840, led to dramatic increases in the use of the postal services although his penny postage resulted in greatly reduced revenues.[7] Hill's principles were adopted in New York, in 1847 and they are now applied universally.

As transportation facilities improved, so did mail delivery times. The improvement in efficiency, and standardisation of rates and methods of handling, had a beneficial effect on the growth of businesses, encouraged the distribution of printed material (thus aiding the spread of knowledge and education) and allowed increased social contact between individuals in diverse communities. Mail service provided a small step toward the information age.

The Telegraph

The telegraph offered a further improvement in communications. It grew out of the needs of the military who, until its invention, had relied on semaphore and flag signals. The railways also demonstrated an urgent need for a means of instantaneous communication, as early accident records prove. The telegraph was first demonstrated by Samuel Morse in 1844. Simultaneous two-way transmission was developed in 1853 and, by 1865, the Great Eastern Company had succeeded in laying a cable under the Atlantic.

Once it had been demonstrated, numerous applications were found for the new telegraph, but its use was still limited to the wealthy because of the costs involved. An early improvement was the printing telegraph. This was not wholly reliable and various attempts to increase its efficiency led, eventually, to the production of the teleprinter. The latter did not come into full use until the middle of the twentieth century, when it provided an early means of facsimile transmission.

The Telephone

The invention of the telephone was a natural step forward from the telegraph although it was over thirty years before the step was made. Bell invented the first telephone capable of practical use in 1876, and predicted its widespread application. His prophecies were scorned but, by 1978, there were 63.3 telephones for every 100

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[7] *Encyclopaedia Britannica: a New Survey of Universal Knowledge*, Vol 18 (Chicago: Encyclopaedia Britannica, Inc., 1962), pp. 303 - 307.

people in Canada and 74.4 for every 100 in the United States.[1]

The telephone has had an overwhelming influence on the development of western civilisation. It has revolutionised business practice and has strongly influenced social and leisure activities. It has reduced the importance of distance and, thus, helped to destroy another communication art, the social letter.

The potential influence of the telephone is still only dimly glimpsed by the general public. The existence of cabling, of exchanges, of automatic switching techniques, of time division multiplexing and digitisation of data are constantly increasing its capabilities and its influence.

Photography

Photography is a less powerful medium of communication but it was a root from which several new communications media were to spring. Its invention is another example of entrepreneurial action. By the end of the eighteenth century, traditional artists could no longer satisfy the demand for their products. This situation occurred as a result of the rise of the new middle class who, like the aristocracy before them, wanted pictures of themselves and of beautiful scenes.

In 1839, Daguerre provided a temporary solution but copies of daguerreotypes were expensive and difficult to produce. Consequently, there was a clear need for an improved method of reproduction. The solution to the problem was not discovered until 1888, a half century later, when Eastman produced paper coated with gelatine which became known as 'American film'. Almost immediately, he replaced this with celluloid. Since that breakthrough, film and lenses have constantly improved in both speed and sensitivity.

Cinematography

Once continuous film became available, moving pictures and the cinema were almost inevitable. In 1889, the first movie was produced by Edison and Dickinson, building on the work of Muybridge but it was not until 1895, that the first cine-camera was demonstrated, by Marey, to the French Academy of Sciences. His work was also based on that of Muybridge. The Lumiere brothers used Marey's principles and opened the first cinema, in Paris, within the year. Sound became available, in 1923 but little

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[1] E.B. Ogle, *Long Distance Please: the Story of the TransCanada Telephone System* (Toronto: Collins Publishers, 1979), p.16.

interest was shown in it until the Depression provoked producers into searching for a new means of attracting audiences. Colour was introduced in 1935.

Radio

Radio also provided a major step toward the communication age. The existence of radio waves was predicted as early as the mid-19th century but it was not until 1887 that their existence was proven by Heinrich Hertz. Radio became a viable communication medium when Lee de Forest invented the vacuum tube, in 1906. This aided amplification and, eventually, made radio listening a communal activity.

Although radio was essentially a medium of entertainment, it was also informative but for many years, this potential remained unrecognised. In 1919, the results of the Harding/Cox presidential election were announced by a small radio station in Pittsburgh and suddenly, the immediacy and usefulness of radio, as a news dispensing medium, were recognised. In 1920, the first, fully licensed commercial broadcasting station was established in the United States. There, the growth of networks was vital if radio was to progress and after 1927, these developed rapidly.

In both the United Kingdom and Canada, recognition of the potential of the new medium led to a concern that a regulatory agency should be established. In 1927, the United Kingdom established the British Broadcasting Corporation. This remained a government monopoly until 1954, when the Independent Television Authority was established. Canada set up the Aird Commission, in 1929, and following its recommendations, the Canadian Radio Broadcasting Commission (CRBC) was organised in 1932. The existence of several privately owned radio stations prevented total adoption of the British system. In 1936, the CRBC was replaced by the Canadian Broadcasting Corporation (CBC),[9] whose powers and responsibilities were more clearly defined. The Broadcasting Act of 1958 established the Board of Broadcast Governors (BBG), when it became apparent that the CBC's dual role as regulator of broadcasting licences and as its own governing body were causing misunderstandings within the broadcasting community. Because of ambiguities within the Act, however, this led to serious problems. These were not resolved until 1968, when, following the recommendations of the Fowler Commission, the role of the BBG was clarified. At the same time, its name was changed

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[9] *Encyclopedia Canadiana: the Encyclopedia of Canada*, Vol. 2 (Toronto: Grolier Sociey of Canada Ltd., 1977), pp. 110 - 118.

to the Canadian Radio-Television Commission (CRTC).

In the 1930's, advertising revenues improved, in both Canada and the United States and radio finally began to challenge the newspapers as a news medium. Radio remained prosperous, in both countries, until the advent of television. After that, privately owned, network radio dwindled in importance although local stations have remained viable and popular.

Television

The invention and introduction of television offers a clue to the speed at which the new communications media might be accepted. The basic principle of television was demonstrated as early as 1873, by May, an English telegrapher but it provoked little interest. It was not until fifty years later that the first crude application of the principle was demonstrated by Baird, in 1923. An improved version appeared in 1925. The first public service was offered in 1936, in England and 1941, in the United States, but pictures were poor, the receivers were expensive and people were preoccupied with the War. After 1945, interest revived but the Federal Communications Commission halted development, in the United States, while it deliberated over distribution of wave frequencies. This halt was used by corporations to safeguard their interests. Once the ban was lifted, the television industry developed very rapidly. The number of television sets in use, in the United States, increased from one million in 1949, to ten million by the end of 1951.[10] Colour was introduced in 1954.

By 1975, there were 112 million television sets, in use in the U. S., covering 97% of all homes.[11] The *Canada Yearbook 1978-1979* indicates that the situation is similar in Canada. 97% of Canadian households have television sets and as of May 1977, 67.8% had colour. Cable is available to 83% of Canadian homes.[12]

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[10] *Encyclopaedia Britannica: a New Survey of Universal Knowledge*, Vol 21 (Chicago: Encyclopaedia Britannica, Inc., 1962), p. 911.
[11] Agee, Ault and Emery, op. cit., p. 275.
[12] Canada. Statistics Canada, *Canada Yearbook 1978-79: an Annual Review of Social and Political Developments in Canada* (Ottawa: Supply and Services, 1978), p. 676.

D. Conclusion

Cinema, radio and television are the natural outcomes of all the other nineteenth century inventions and innovations in communications. These had gradually destroyed the isolation and self-reliance of small communities and substituted the larger units of modern, mass society. Technology then generated entertainment systems which abetted the process. There was a need for entertainment. The soul destroying labour of the assembly line, over-crowding in the dingy, industrial towns and the consequent alienation from the environment; ensured the success of any escape mechanism.

By the 1970's, new influences, generated by technological innovations and social pressures, were beginning to be felt. These may fore-shadow a reversal of the hundred year movement toward mass entertainment. New trends toward individualisation have been made feasible by the advent of the computer. The combination of the latter, with the technologies underlying the telephone and television, strengthens this possibility and portends the development of new sociological perspectives.

Notes on Chapter 2.

The above information as a brief overview of the highlights of the history of communication, based chiefly on the following sources.

Agee, W.K., P.H. Ault and E. Emery. *Introduction to Mass Communications.* New York: Harper and Row, 1976.

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III. The Development of the Computer.

A. Introduction

During the last century, only a few inventions have clearly affected our everyday lives and nearly all of these have been directed toward increasing our ability to communicate. They include radio, television, the automobile and the aeroplane. The latest to make its influence felt has been the electronic, digital computer.

B. The History of the Computer

The computer may be viewed as the latest result of man's efforts to produce a calculating machine. As such, it has a long and uneven history beginning, perhaps, with the invention and use of the abacus. It was not until comparatively recently that the need for an improved means of calculation provoked inventions of devices that actually removed some of the effort necessary to the process. These included Pascal's desk top calculator, logarithm tables and the slide rule. Not all calculating devices were successful. Babbage's difference and analytical engines never actually worked although they are of interest because they incorporated some of the features of modern computers.

Today's computer is a descendant of the inventions of Hollerith, who introduced the use of punched cards in his efforts to handle the 1890 U.S. Census; of Aiken's Mark 1 which relied on mechanical relays; of ENIAC which used vacuum tubes; and finally of UNIVAC 1, which was the first, fully electronic computer. This last employed stored programmes and was able to handle alphabetic as well as numeric symbols.[13] Early computers cost millions of dollars, consumed large quantities of electricity, required large areas with special cooling equipment to house them and were extremely unreliable.[14] Modern computers bear little resemblance to their ancestors. They are more compact, more efficient and so much cheaper that they are gradually invading every aspect of our civilisation.

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[13] Charles H. Davis and James E. Rush, *Guide to Information Science* (Westport, Conn.: Greenwood Press, 1980), pp. 151 – 163.
[14] John Madden, "Simple Notes on a Complex Future," D. Godfrey and D. Parkhill, eds. *Gutenberg Two*, 2d ed. (Toronto: Press Porcepic, 1980), pp. 39 – 48.

The Advent of the Transistor

A major step toward this cheapness and efficiency was the advent of the transistor. This eliminated the vacuum tube and in one major breakthrough reduced the size, power consumption and cost of the computer, at the same time increasing its reliability. At first, transistors were difficult to produce. The silicon wafer crystals must be of very high purity and it is necessary to introduce highly controlled quantities of impurities called dopants. Even today, each batch of transistors may yield only a small percentage that can perform within required tolerances. Even so, manufacturing costs have declined steadily.

The Integrated Circuit

The need to improve yields led to a series of refinements and eventually, to the introduction of photolithography into the transistor manufacturing process. The addition of resistors and capacitors to the transistor was a natural advance. This was the beginning of the integrated circuit or "chip". Computers use integrated circuits in vast numbers. Almost all are used as switches which are simpler and easier to manufacture than those used for other purposes. Yield has remained a problem and has led to further attempts to increase both the size of the chip and the number of circuits per chip. The effort has been successful. In 1964, it was possible to produce 3000 circuits per square inch of silicon wafer. By 1977, this number had risen to 350,000.[15] The limits of circuit density are set by the fineness of the lines which can be reliably reproduced and this is determined by the wavelength of light used to project the image. By moving from ultra-violet light to shorter wavelengths, or to electron beam projection, further reductions can be achieved.

The number of circuit components per chip has approximately doubled every year, since 1959 [16] and it is expected that this trend will continue. The terms 'medium scale integrated circuit' and 'large scale integrated circuit' have been used to indicate the progressive increase in the number of circuits produced on a chip. The term 'very large scale integrated circuit' is now in use to describe the latest advances in this area. However, new developments are already under way. Great optimism is being indicated about the Josephson junction. This device operates at temperatures close to absolute

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[15] Madden, op. cit., p. 43.
[16] Ibid.

zero and requires even less power and space than today's transistors.

Beyond the Integrated Circuit

Corning Laboratories are now working with a process called molecular beam epitaxy and have produced semiconductors that are thirty times as fast as today's silicon chips. Apparently, even greater speeds are possible. A transistor known as a planar dopped barrier is under development.[17] It is intended for military use but this has been true of many advances in computer science. It, too, will presumably, eventually penetrate the commercial market.

The Development of the Microcomputer

One of the direct consequences of this ability to squeeze vast numbers of circuit components into a tiny space was the invention of the 'computer on a chip'. The first microcomputer was produced in California, in 1971. Advances in integrated circuit development have consistently increased the power of these machines, gradually moving them out of the hobby market into business and professional applications. Today's microcomputers may have as much as 256K of internal memory and the ability to add considerably more by means of discs and disc drives. But these limits have already been superseded. In February 1981, Intel Corporation introduced a microprocessor that it called a micromainframe because it uses the same wordwidth (32 bits) as some mainframe computers. This allows the microcomputer using this device, very much more power than any of its predecessors.[18]

C. The Mainframe Computer

The mainframe computer[19] has achieved a level of sophistication undreamed of even ten years ago. Large numbers of individuals can access it simultaneously, use its programs, store materials in private files and obtain printouts in page format.

In these digital computers, integrated circuits perform a wide range of tasks. They serve as microprocessors, peripheral and interface devices and perform logic functions. Because of their high speed and low manufacturing cost, semiconductor memories (other

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[17] Natalie Angier, "Molecular Devices," *Discovery*, Vol 3, No 2 (February, 1982), p. 68.
[18] "Micromainframe is Newest Computer on a Chip," *Science*, Vol 212, No 5 (May, 1981), p. 527.
[19] Technical information related to computer functions is based on Frederic G. Withington, "Computer Technology: State of the Art," *Journal of the American Society for Information Science*, Vol 32, No 2, (March, 1981), pp. 124 – 130.

integrated circuits) are used almost exclusively, in all computers.

Computer Architecture

Many general purpose computers in use today were designed when electronic components were expensive. Consequently, they are processor oriented. That is, the central processing unit (CPU) controls all activities including input, control, processing and output functions. The only component outside the CPU's control is the controller for the input/output devices. Unacceptable delays would be caused if this were otherwise.

As each semiconductor memory device is, in fact, a small self-contained computer, memory capability can be distributed throughout a computer system, so that not all operations need involve the CPU. New general purpose computers are storage centered. Such systems may have one or more types of processors, one or more CPU's and zero or more communications processors. This architecture has several advantages. Although it uses more electronic components, it is highly failure resistant and allows very high throughput because each type of processor is programmable and capable of autonomous operation.

A major disadvantage of this style of computer architecture lies in the large number of connections needed. These create an equally large number of potential trouble spots and increase costs. The storage controller may also become a bottleneck, although a partial solution to this problem lies in increasing the number of storage controllers. However, this means that the processors must spend time communicating with each other so that system throughput does not increase in proportion to the number of processors added to it. The solution to this problem lies in the possibility of creating a single communications bus, for interconnections among processors and memory. At present, bus speeds are too slow for general purpose computers, although communications buses are used on mini- and micro- computers. It is hoped, however, that optical fibre, which has far greater speed and transmission capacity than copper, will permit bus use in general purpose computers of all sizes, in the near future.

System Control Programmes

A computer's system control programmes include the operating system, the data base manager, the compiler, which is a programme writing aid, the communications control programme and various utility programmes.

Operating systems must schedule jobs and allocate the major resources of the system. They extend the logical capabilities of the machine and make it easy to use.

The data file management system creates files and maintains them. It can add and delete as required and provide reports on the number of transactions processed and the current status of the system. It provides mechanisms for linking data to programmes and linking users to data bases, through terminal control systems.

Communications control systems control remote terminals of which there may be several on one line. This controller also controls message queueing, activation of application software, message editing, and network and terminal functions.

Utility programmes provide for maintenance, measurement, accounting and housekeeping requirements. They record information about system activity. An example might be the amount of CPU time used, the amount of main memory used, the computer time used and the amount of data transferred, for each job run. Other utility services may include sorting programmes, repetitive data processing functions and media conversion, (e.g. from magnetic tape to disc). The greater the number of utility programmes, the greater the ease of use and versatility, of a general purpose computer system.

D. Storage, Input and Output

The incredible capability of the modern general purpose computer has led some to suppose that the computer will eventually eliminate print as a communication and information storage medium, but librarians are accustomed to point out that neither scholars, nor the general public, will be able to gain access to the world's knowledge electronically, until full text can be stored economically, efficient methods of input are discovered and information output has been improved. Until recently, none of these problems had been solved and the possible development of computer access to the world's knowledge was derided as belonging to the realms of science fiction. These problems are now all under attack.

Storage

The challenge of data storage has produced a variety of possible solutions. These include several new technologies. Semiconductor memory chips are used for internal storage and for carrying the information which the computer is manipulating. Bubble

memory, also an internal storage device, although slower, is able to store large quantities of data. It has the added advantage of being non-volatile, i.e. data is not lost when power is cut. Holography may eventually provide an even more valuable means of data storage, permitting greater densities of data, at lower cost and providing much more rapid access to the stored information.[20] Magnetic tape, discs and drums are used for external storage.

Videodiscs may prove to be the ideal complement to computer storage and retrieval systems and could contribute, significantly to solving the problems of document delivery. They have storage capacity of 11 gigabits per disk, which is the equivalent of 10,000 printed pages, and rapid, random access is possible. The availability of display devices (television receivers) and the entertainment industry to bear the brunt of developmental costs, places videodiscs in such an advantageous position that further development and commercial application are highly probable. Both videodisc players and their discs are relatively inexpensive.

Although production costs are high for the master disc, reproduction and distribution costs are not. Local storage of information by this means becomes clearly advantageous when the potential cost of computer storage or transmission over telephone lines, even at the cheapest rate, of this amount of information, is considered.[21]

Input

Information input continues to be a major problem. Word processors may provide a partial solution. Many authors are now composing their manuscripts on word processors and offering it to their publishers on floppy discs.[22] Thus, their work is in digitised form from the beginning and so could, conceivably, be retrieved by a reader through a computer terminal. Computer type setting also implies digitalisation of a work being published.

Optical Character Recognition

It was originally hoped that optical character recognition (OCR) would provide a means of converting printed material into digital format so that the resulting data could be

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[20] Sidney Fernbach, "Scientific Use of Computers," *The Computer Age: a Twenty Year View*, ed. by Michael L. Dertouzos and Joel Moses (Cambridge, Mass.: MIT Press, 1980), p. 155.

[21] Peter Shipma and David D. Becker, "Text Storage and Display via Videodisk," *Communicating Information*, Proceedings of the 43rd ASIS Annual Meeting, Anaheim, Cal., 5 – 10 October, 1980, Vol 17 (White Plains, N.Y.: Knowledge Industry Publications, Inc., 1980), p. 105.

[22] J. D. Reed, "Plugged in Prose," *Time*, Vol 115, No 32 (10 August, 1981), p. 55.

stored, electronically and would be retrievable, on demand. In fact, OCR proved to be difficult to accomplish. Early systems required great care on the part of the operator, use of special forms and expensive equipment. Even then, these systems could not recognise hand written documents and were limited to certain fonts. Today, although the most advanced systems can read and interpret hand written documents and can recognise a variety of fonts, the systems still suffer from high costs, equipment incompatibilities and accuracy problems.[23] Consequently, it appears that OCR systems are still far from providing a commercially viable means of document conversion.

Telefacsimile

A system which can convert documents into electronic format is telefacsimile. This technology, ignored for many years as being of doubtful usefulness, may provide a major advance in the data input area. Early facsimile technology dates back to the mid-nineteenth century but the business market did not develop until the 1960's, when it became possible to use the telephone networks for document transmission. Even then, systems were plagued with problems. Output quality was poor, costs were high and the equipment was unreliable.

McKean notes that, at present, telefacsimile is the only non-surface mail, document delivery system which can handle graphics as an integral part of the text, which can transmit non-Roman alphabets with ease and can convey signatures, hand-written drafts and sketches.[24]

Telefacsimile does not convert documents on a character by character basis. Instead, the document is scanned, usually at a rate of 96 lines per inch and an analogue signal is sent to a receiving terminal. In digital facsimile systems the scan lines, not the characters, are digitised. The advantage of digitisation is increased transmission speed but equipment needed, for this method of information transmission, is expensive. Telefacsimile technology could, therefore, be used to store data electronically, provided that the material was to be used for "read only" purposes. Storage, by the means described above, would not accommodate editorial changes. Most telefacsimile systems,

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[23] Daniel M. Costigan, *Electronic Delivery of Documents and Graphics* (New York: Van Nostrand Rienhold Co., 1978), p. 265.
[24] Joan Maier McKean, "Facsimile and Libraries," *Telecommunications and Libraries: a Primer for Librarians and Information Managers* (White Plains, N.Y.: Knowledge Industry Publications, Inc., 1981), p. 91.

presently in use, however, are of the analogue type. In these systems, resolution is not sufficiently high to reproduce footnotes or other tiny print, data cannot be read from bound volumes and the systems suffer, as do other technologies, from incompatibility problems.

In 1978, the University of Denver was involved in a project designed to demonstrate and evaluate the use of non-broadcast telecommunications technology in the delivery of public services. The facsimile project was called TALINET and involved several libraries, but it re-emphasised known weaknesses.[25] Disadvantages of telefacsimile, other than those already noted, included costs, which were higher than regular mail costs and uncertainty of user need.

However, the newest technology involves improved transmission systems, is digitally based and uses laser scanning techniques for both transmission and recording. Recently developed receivers can function as facsimile or high speed teleprinter terminals. Equipment costs are dropping and storage devices have now been developed which allow transmission to be delayed until off-peak hours. This reduces communications costs. Several major corporations have indicated an interest in telefacsimile transmission, including American Telegraph and Telephone (AT&T) and Satellite Business Systems. Libraries may, therefore, eventually reconsider telefacsimile use, particularly for inter-library loan purposes, but the technology is not yet sufficiently versatile to be an attractive medium for inserting print materials into computer storage.

Voice Recognition Systems

Another device that may eventually be used for input of data is voice. Voice recognition systems can now decode continuous speech regardless of accent or inflection, within a vocabulary range of 500 - 600 words and research is continuing. The present limitations include: the range of accents that can be identified and the meaning of inflection. This would require linguistic analysis. Voice recognition systems are now in use in manufacturing environments, where a worker's hands and eyes are too busy to allow key entry or writing.[26]

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[25] McKean, op. cit., p. 100.
[26] C. Burns, "Information Storage and Display," *Journal of the American Society for Information Science*, Vol 32, No 2 (March, 1981), p. 143.

Output

The last problem, information output, can be solved in several ways. Printers can provide hard copies on demand, plasma display screens are currently under development and in the more distant future, audio synthesis will provide voice feedback.

Printers

There is a wide variety of printers currently available, varying from the typewriter-like printers used for computer terminals to those used by commercial establishments which work at speeds in excess of 3000 lines per minute. Older printers are all of the impact type. They work on the principle which involves the use of hammers to impress a relief image of the desired character on a page. Improvements in electronics have led to the invention of the non-impact printer. Non-impact printers use a spray of ink droplets or a photo-electric or electro-static process to create the desired image in the form of an electric charge to which a liquid or powder pigment is attracted. Transfer of this to paper provides a hard copy. As the printed image is determined by the software, an endless variety of fonts, numerals, special characters, universal product codes and even signature replicas, are all possible.[27]

The process is called raster output laser imaging and the Xerox 9700 is an example of a printer that uses this process. It is unlikely that this type of printer will ever be really cheap. It is expected that even small versions will cost several hundred dollars well into the 1980's but it is hoped that small message printers will, eventually, become cheap enough to be used in homes.[28]

Plasma Display Panels

The gas discharge, or plasma display, panel may also prove to be a versatile output medium. The panel consists of two glass plates sandwiching a mesh of electrodes whose interstices are filled with neon argon gas, under pressure. No vacuum tube is needed. Panels 8.5 inches square can accommodate 2048 characters, and larger screens are under development. The screens do not flicker, they have high brightness and their life expectancy is greater than that of the cathode ray tube. Because each gas chamber is either alight or not alight, the screens are admirably suited to the accommodation of digital sources of information. The screens have been slow to reach the commercial

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[27] Withington, op. cit., p. 127.
[28] Burns, loc. cit.

market because they are expensive to produce. However, integrated circuits are now replacing some of the expensive components and costs should decrease as a consequence.[29]

Voice Synthesis

Voice synthesis is another possible output device. Equipment components capable of 64 phonemes in four levels of inflection sold for $1000 five years ago. By 1981, they cost $25. The equipment is used to prompt pilots, language students, manufacturing workers and to aid the vocally handicapped. In future, voice synthesis may provide ground control instructions, warn home owners of potential problems, guide car drivers and provide voice feed-back to equipment operators, typists and burglars.[30]

E. Artificial Intelligence

Scientists agree that we are likely to use voice in communicating with computers by the year 2000 but, even then, the computer may not understand. Recognition of the need for such understanding has led to a great interest in artificial intelligence, and it is in this area that the most important future developments in computer science are likely to take place.

When computers were first developed, in the early 1950's, they were referred to as electronic brains and popular mythology predicted that machine intelligence would replace man's. It soon became apparent, however, that this would not happen. The computer is not an intelligent entity. It requires detailed instructions and can only perform in accordance with them. Nevertheless, the desire to produce machine intelligence has driven researchers to persist in its pursuit, in spite of the incredible difficulty of the task.

The study of artificial intelligence was first recognised in 1956, when it was discussed by various delegates at a Dartmouth Summer Institute Meeting.[31] By 1964, MIT, Stanford Research Institute, Stanford University and the Carnegie-Mellon University had become recognised as the four major centres of development of the new science. Scientists in these institutions worked on mobility and manipulation programmes, which

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[29] Costigan, op. cit., p. 253.
[30] Burns, loc cit.
[31] Factual information in this section is based on Marvin L. Minsky, "Computer Science and the Representation of Knowledge," *The Computer Age: a Twenty Year View*, ed. by Michael Dertouzos and Joel Moses (Cambridge, Mass.: MIT Press, 1980), pp. 392 - 421.

soon led to the desire to make computers respond to commands given in natural language.

Early cybernetics launched the search for a simple, powerful, general principle upon which to base a theory of intelligence. The search failed but work stemming from this ambitious endeavour led to a key concept in artificial intelligence. This was Newell and Simon's 'general problem solver system' which successfully separated the general principles of the search strategy from the details of the search itself.

One of the most productive of the early approaches to problem solving involved a system called heuristic tree search. It was analogous to finding the apple in a tree by starting at the trunk and making a decision on how to proceed at each fork. Artificial intelligence has now moved beyond such simple strategies but fundamental ideas from this early period are still considered important. It is now considered more productive to work at a higher level by, for example, analysing goals, reformulating problems and using knowledge based processes.

By the 1960's, the idea that computer programmes could be made to exhibit some intellectual qualities had been accepted. They had demonstrated the ability to resolve certain problems, such as some of those involved in playing chess. Nevertheless, critics drew attention to the inability of such programmes to accommodate intuition or cope with analogies and metaphors.

In 1964, Evans completed a programme that did involve the use of a form of analogy, but it was ten years before his work was further advanced. Part of the reason for this delay was the lack of a technology that could use two different representations of knowledge, at the same time.

In the early 1950's, attempts were made to use computers to perform direct translation from one natural language to another. It soon became apparent that 'word for word' translation was not practicable. Eventually, a two step process was developed. In this process, the sentence would be understood in the sense that a new data structure would be constructed to represent things and the relation between things.[32] This data structure would then be used to generate a verbal description in the target language.

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[32] Ibid., p. 407.

This, in turn, led to a new area of research, that of trying to make computers understand natural language. Winograd was responsible for a major step forward in this area when, in 1971, he produced his highly interactive question and answer programme. This programme was the first to appear to be able to handle the meanings of a broad class of apparently natural, English sentences. However, the problem of meaning was not solved by this advance, because Winograd's programme was able to function, only in a particular situation.

In the early days of artificial intelligence development, the problem of making computers learn presented an intriguing challenge but lack of understanding of the learning process prevented advance, in this area, for many years. Winston was the first to provide an effective demonstration of computer learning and this did not occur until 1975. In this system, the programme compares what it sees with a conceptual structure and then uses this information in describing subsequent experience. Winston's work was a milestone in the field of learning because it could make strong, significant generalisations from very small numbers of examples.

A recent success is Sussman's work. In this, the computer debugs its own programmes. This marks the beginning of rudimentary consciousness[33] because the programme can monitor its own performance, remember what happened and make modifications to its behaviour, in response to "dissatisfaction" with what it did.

The Person/Machine Interface

One application of machine intelligence that is particularly desirable is a means of improving the person/machine interface but this would involve the development of natural language responses from the computer.

In considering this problem, Raphael[34] observed that, in the ideal question answering system, the computer would achieve four goals. It would accept facts and questions and make appropriate responses, all in the form of natural English. It would store, remember and make efficient use of a large amount of data, at least thousands of elementary facts. It would answer questions that required it to figure out the logical consequences of the facts stored, explicitly, in its memory and lastly, it would operate

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[33] Ibid., p.419.
[34] Bertram Raphael, *The Thinking Computer: Mind Inside Matter* (San Francisco, Cal.: W.H. Freeman, 1976), p. 194.

conversationally, that is, via a time sharing computer terminal, without frustrating delays. No system has yet developed all four of these capabilities but a significant degree of success has been achieved in each of the areas, separately.

It has been predicted that within the next 15 to 20 years advanced explanation systems, strong natural language capacities, highly satisfactory speech generation and a moderate degree of speech understanding will be in use.[35]

In fact, some advances have already been made in regard to the last two items, as already noted, but computers are still very far away from being able to handle unrestricted dialogues. As can be seen, various aspects of artificial intelligence have been attacked, over the years but the development of unequivocal machine intelligence appears to be likely to occur, only in the far future.

F. Conclusion

In spite of the slow development of machine intelligence, the electronic digital computer has evolved very rapidly. It began as an exorbitantly expensive and unreliable prototype that could achieve desirable results, only under the watchful eyes of skilled technicians. It is now a sophisticated tool whose influence affects all aspects of Western civilisation. Costs have decreased consistently, over the last three decades, even as versatility and reliability have increased. Users no longer need to be knowledgeable of the computer's internal organisation in order to be able to use it and as a result, the machine has invaded all areas of society.

But the computer has not yet achieved its full potential. Research is continuing to improve the integrated circuit, computer architecture and input and output devices, as well as the person–machine interface. Forecasts of the computer's future capability and usefulness range from the possibility of eliminating work as we know it, to the development of portable personal computers that will be programmed to aid their owners in all aspects of decision making.[36] It is possible that the versatility of the machine will be limited, only by man's imagination.

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[35] Terry Winograd, "Toward Convivial Computing," *The Computer Age: a Twenty Year View*, ed. by Michael L. Dertouzos and Joel Moses (Cambridge, Mass.: MIT Press, 1980), p. 70.

[36] John Madden, "Julia's Dilemma," David Godfrey and Douglas Parkhill, eds. *Gutenburg Two*, 2d ed. (Vancouver, Press Porcepic, 1980), p. 26.

The computer's influence on libraries, as on any other aspect of society, is likely to be dramatic. It is already responsible for major changes in both the institution and the library profession.

Notes on Chapter 3.

Chief sources of information used in this chapter are as follows:

Crawford, Susan. "Perspectives on ... Computer and Communications Technology." *Journal of the American Society for Information Science*, Vol 32, No 2, March, 1981.

Davis, Charles, H. and James E. Rush. *Guide to Information Science*. Westport, Conn.: Greenwood Press, 1979.

Godfrey, David and Douglas Parkhill, eds. *Gutenberg Two*. 2d ed. Vancouver: Press Porcepic, 1980.

The Computer Age: a Twenty Year View. Ed. by Michael L. Dertouzos and Joel Moses. Cambridge, Mass.: MIT Press, 1980.

IV. New Developments in Communications.

A. Introduction

The twentieth century is notable as a period of enormous growth in the ability of human beings to move large quantities of messages, almost instantaneously. The last century and a half has been prolific in its production of new communications methods, but the last 15 years have witnessed an incredible acceleration of this activity. Many of the great inventions and technical advances of this period have been concerned with the movement of information (images and words) over distance. They have included computers, microwave communications links, fibre optics, satellites and lasers.

Kochen has suggested that technologies develop in three stages. In the first, they enable us to do what we are doing now better, faster and more cheaply. In the second, they enable us to do what we cannot do now. In the third, they change our lifestyle.[37] Computer technology has not yet completed the first stage. The computer has become faster, cheaper and better but it is expected that these trends will continue. Communications technology has already attained the third stage and is in the process of changing our lifestyles, as nothing ever has before.

B. Growth of Canadian Communications

The Science Council of Canada reports that while Canada's energy capacity has increased 1000 times and her weaponry has increased 1,000,000 times her communications capacity has increased 10,000,000 times.[38]

James Braque[39] has said that Canadians are more open to rapid change than any other advanced nation and the high standard of living, involving the use of numerous inventions and gadgets, tend to support this thesis. The country's vast area, harsh climate and thinly distributed population, tends to promote ready acceptance of those inventions which improve convenience and living standards. Consequently, it is not surprising that Canada has the greatest financial investment in communications technology of any

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[37] Manfred Kochen, "Technology and Communication in the Future," *Journal of the American Society of Information Science*, Vol 4, No 5 (June, 1978), p. 148.
[38] Patricia M. Hindley, Gail M. Martin and Jean McNulty, *The Tangled Net: Basic Issues In Canadian Communications* (Vancouver: J.J. Douglas, 1977), p. 1.
[39] Quoted in J.R. Kidd, and G. Selman. *Coming of Age: Canadian Adult Education in the 1960's* (Toronto: Canadian Association for Adult Education, 1978), p. 7.

country in the world, on a per capita basis.[40]

C. The New Communications Technologies

Computers alone would have a strong influence on the work place and probably, on the home but their ability to contact each other over long distances at insignificant cost, heralds the dawning of a new era. The new electronic communications systems now under development will eventually provide cheap, instantaneous communication and will accommodate millions of users.

A recent development that is now in use is the transmission of information by microwave link but the inventions presently causing the greatest excitement are the satellite and fibre optics. Laser beams are also under concentrated study.

Communications Networks

In order to transmit information electronically, networks are needed.[41] There are three types. They are: circuit-switched telephone networks, fast-connect circuit-switched and packet-switched networks. Circuit-switched telephone networks and leased lines provide a link between users by circuit switching. Different path segments are physically connected and costs are relatively high. The system is designed for voice transmission so has limited bandwidth (3000 Hz). It is not ideal for data communication, except at low speeds, because the signal becomes distorted at bit rates greater than 1200 baud (1200 bits/sec). A leased line, dedicated to data transmission, is faster but more expensive.

In a fast-connect circuit-switched network, the paths are still physically connected but technology has improved the connect time so that the system can cope with faster transmission rates. It is not widely available in North America.

Packet-switched networks eliminate the need for physical connection for the duration of the call. These networks are dedicated to data transmission. The Canadian system is known as Datapac and was the first packet-switching system in the world operated by a common carrier.[42] The data is collected into packets of 2040 bits and is

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[40] Hindley, Martin and McNulty, op. cit., p. 1.
[41] George R.Thoma, "Transmission of Information: an Overview." *Journal of the American Society for Information Science*, Vol 32, No 2 (March, 1981), p. 134.
[42] E.B. Ogle, *Long Distance Please: the Story of the TransCanada Telephone System* (Toronto: Collins, 1979), p. 250.

transmitted at 5600 baud. Each packet has a leader giving address and a tail containing checking information. The packets are sent along whatever network path is open, are reassembled into their proper order at their destination and stripped of their heads and tails. The user has the impression that he is using a dedicated circuit. In fact, no physical connection exists between the end points of the communication link. The system is very economical. Telenet and Tymnet in the United States work on the same principle.

Microwave Transmission

Microwave transmission of information provides a wide bandwidth and low interference levels but its application is limited, by the curvature of the earth. Repeater towers are therefore, necessary every 30 miles. Consequently, although radio and television stations use this medium to reach their clientele, for longer distances, satellites are usually a better option. There are, however, microwave transmission links from coast to coast across Canada. The system was first completed, in 1959 but equipment has been constantly upgraded, first, for stereophonic sound and then, for colour television signals. It now has a carrying capacity of 1200 voice channels, or the equivalent, in video or data per microwave channel.[43]

Satellites

In 1945, Arthur C. Clarke suggested [44] the use of satellites as a means of communication, but it was not until 20 years later that the first commercial trans-oceanic satellite transmission service became available.

Sputnik marked the beginning, in 1957, by sparking the race to the moon. Communications tests became an early American priority. Early Bird was launched by the Communications Satellite Corporation (COMSAT) in 1965. It was owned by the International Telecommunications Satellite Consortium (INTELSAT) which now represents 107 member nations. Early Bird was placed over the Atlantic and served Eastern North America and Western Europe. It had bandwidth and power for 240 voice channels or one television channel. Intelsat IV is the satellite that is presently in greatest use. It can handle 9000 voice channels or twelve television channels. Intelsat V, to be launched this year, will double these figures and an even more powerful satellite, Intelsat VI, is planned for

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[43] Ibid., p. 215.
[44] Clarke, A.C. "Extra Terrestrial Relays," *Wireless World*, (October, 1945).

the mid 1980's.[45]

Earth stations, used to transmit and receive information from satellites, must be placed in electronically quiet areas but close to major communications centres. Each requires a powerful transmitter to beam signals up to the satellite, a sensitive low noise receiver to detect signals from the satellite and a parabolic antenna. The more capable the satellite, the less capable and hence the cheaper, the earth station needs to be.

A typical international earth station costs $2 to $3 million and is equipped with a gigantic antenna, perhaps 25 meters in diameter. A series of experiments was done in the 1970's, to investigate the possibility of lowering costs and decreasing the size of these earth stations. The most recent of these experiments was the Communications Technology Satellite (CTS) jointly developed by the U.S. and Canada. It was launched in 1976 and continued supporting experiments until 1979, in video, two-way video conferencing, digital and data transmission. These experiments were conducted by health and education agencies, private companies and universities. CTS had a more powerful transmitter than any other satellite and operated at higher frequencies. The former feature allowed video reception with the use of earth stations equipped with antennae as small as one meter in diameter.

Countries with large land masses, like Russia and Canada, needed better overland communications and this led to the development of domestic satellite systems. Canada's Anik 1 was the first geostationary satellite orbited for domestic use. (Geostationary orbit means that the satellite remains in the same place relative to the earth. To achieve this, it must be placed 22,500 miles above the equator.) Because domestic satellites cover smaller areas, their power is concentrated so that they can be used in conjunction with smaller and cheaper earth stations. The parabolas are typically about one third of the size of international dishes. The disadvantage of this form of communication is that, even at the speed of light, it takes half a second for a message to reach and be re-transmitted by, the satellite. This creates a problem for voice transmission.

It has been forecast that satellites will be broadcasting directly to private homes within the next ten years. The forecast appears to be conservative. The September 7, 1981 issue of *Time* included an article in which it was estimated that there are now

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[45] Technical information on satellites is based on Thoma, op. cit., pp. 138 - 140.

between 10,000 and 20,000 privately owned earth stations in use, in the United States, and that, by 1983, this figure will reach 50,000 to 60,000. Costs are also beginning to drop. Prices quoted by *Time* ranged from $3500 to $14,000, but a group of high school students made their own for approximately $1700. It is predicted that an earth station will cost as little as $500, by the mid 1980's.[46]

These advances in satellite technology should produce: a considerable decrease in the cost of long distance communication, wider availability of television signals (whose coverage was previously limited by distance) and eventual reduction of the significance of international boundaries.

One other technical advance is also of importance. The space shuttle will, eventually, allow repair of satellites in place. It will also reduce launch costs by carrying them into orbit.

As a consequence of the advances in satellite technology, there is now a stampede in progress to acquire and use satellite space. The United States has 200 satellites in orbit or planned.[47] A conference on strategic planning for satellite systems was called, in April 1981, where note was taken of the fact that all projections for satellite service requirements have been conservative. Between 20 and 30 satellites are scheduled to be launched within the next five years. The sky is already becoming crowded. Satellites must be one to ten degrees apart, depending on their frequency and power of operation. However, technical advances, such as switched time division multiple access, promise compression of more channels within the available bandwidth of each satellite. Large space platforms should also help to mitigate the over-crowding problem.[48]

Although most satellite use has been for military, corporate and later, broadcasting purposes and telephone links, some are now being used for educational purposes. The Appalachian Community Services network offers coast to coast educational programming and expects to expand to two million subscribers, in 1982. Others include such Canadian educational services as the Ontario Educational

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[46] Jay Cocks, "Earth Stations: Sky in the Pie," *Time*, Vol 118, No 10 (7 September, 1981), p. 66.
[47] Ian James, "IASU: International Association of Satellite Users," *Bandwidth*, No 4 (August, 1981), p. 58.
[48] Ibid.

Communication Authority's use of videotex by satellite,[49] British Columbia's *Knowledge Network* and Alberta's newly launched *Project Outreach.*[50]

Optical Fibre

Optical fibre is fast reaching the point at which its economics will force an end to the use of copper for communications purposes. It is cheap to produce because it uses glass, whose basic ingredient is silica, a plentiful element. Optical fibre can accommodate thousands of voice messages per fibre or the equivalent in video or digital data. Optical fibre needs less space than copper cable to carry the same quantity of information and is lighter, stronger and more flexible. The only major factor inhibiting future use is the fact that it may be many years before it becomes economical to replace existing cabling, with this more versatile and much faster medium.

The invention of optical fibre is the result of a combination of several recent developments. It employs the laser which was invented in 1958, the low noise avalanche photo-detector which was invented in 1965 and low-loss, high quality, glass fibre which was not available until 1973. Originally, there were difficulties with splicing and with bending the light around corners but these have been overcome.

To transmit information using this medium, light is passed through a refined glass fibre on the principle of total internal reflection. Each fibre has the diameter of a hair and a single fibre can carry 4032 voice channels. Optical fibres can carry vocal, digital and video information in one cable because there is no cross talk, from one fibre to another. Optical fibres can be used in conjunction with all existing transmission systems.

According to Ogle,[51] in 1978, Alberta Government Telephones (AGT) had one of the most extensive and most sophisticated applications of fibre optics in the world, between Calgary and Cheadle. Edmonton Telephones recently announced the installation of an optical fibre trunk line between two of their high use, busy switching centres, and have stated their intention to make further use of this medium.[52] Other large companies, including the Bell Telephone Company and AT&T, have also indicated their intentions of using optical fibre for trunk lines.

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[49] John Syrett, "Educational Applications of Videotex." Paper given at 'Videotex for Educators Workshop,' Calgary, 25 – 26 September, 1981.
[50] Ian James, "Twinkle, Twinkle Little Star," *Bandwidth*, No 5 (December, 1981), p. 68.
[51] Ogle, op. cit., p. 261.
[52] "Fibre Optics: Tomorrow's Communication Today," *Bandwidth*, No 4, (August, 1981), p. 63.

Laser Beam Transmission

Research into the use of laser beams is holding out great promise. If developments come quickly enough in this field, they may make both copper and optical fibre redundant as communications media. Laser transmission represents another giant leap forward. It has potentially, "immense information carrying capacity – literally millions of television programmes or a billion telephone calls on a single light beam."[53]

Direct beams or diffused blankets of infra-red light can be generated and received over short distances, in air, without connecting links. This technology is cheap and is used widely for TV receiver control, cordless telephones and microphones. Hypothetically, direct beams could be used in data centres to connect a computer and several terminals situated in a "visible" area.

AGT is currently experimenting in this area. It is working with the Alberta Research Council to develop a point to point laser system. A small transmitter and receiver are connected by wires to a computer. Transmitting and receiving devices are located on the tops of high buildings and precisely positioned so that an infra-red laser beam travels in a direct line between the two points. For the field tests, the transmitters will be placed on top of the Medical Science Building, at the University of Alberta and the Alberta Research Council's building in Clover Bar, a distance of 12.6 kms. The field tests will check the effect of adverse weather conditions, fog and snow, etc.[54] It is hoped that this system will eventually, accommodate high transmission speeds, reduce capital costs and improve information security.

D. Conclusion

If the first communications revolution was generated by the invention of writing and the second by the invention of the printing press, the third is being generated by the inventions of the digital computer and the new communications systems. A broad arsenal of new technologies is under development and all hold out both promise and threat, to the advancement of civilisation. Building on major new accomplishments in computer and communications technology, teams of scientists have produced video and graphic

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[53] Ogle, loc. cit.
[54] Bobbi Lambright, "Laser Communications Field Test The Next Research Step For AGT," *Edmonton Journal* (19 September, 1981), p. C1.

imaging systems, low cost electronic storage technologies and potentially cheap, instantaneous and distance independent communications. Such advances must have far reaching influence. It is not yet clear, however, what changes will occur or how quickly their influences will be felt.

Notes on Chapter 4.

Major sources of information used in this chapter were:

Crawford, Susan. "Perspectives on ... Computer and Communications Technology," *Journal of the American Society of Information Science*, Vol 32, No 2, March 1981.

Hindley, Patricia M., Gail M. Martin and Jean McNulty. *The Tangled Net: Basic Issues in Canadian Communications*. Vancouver: J.J. Douglas, 1977.

James, Ian. "IASU: International Association of Satellite Users," *Bandwidth*, No 4, August 1981.

Ogle, E.B. *Long Distance Please: the Story of the TransCanada Telephone System*. Toronto: Collins Publishers, 1979.

V. Some Applications of the New Technologies

A. Introduction

There are several applications of the new communications technologies that are of particular interest to librarians. These include: computer networks, videotex and teleconferencing.

B. Computer Networks

Computer networks can be divided into three major categories. These are bibliographic utilities, search services and customised service networks which are "stand alone" systems. All of these networks have developed during the last decade and all are growing as an increasing number of libraries realise the advantages of using them.

Bibliographic Utilities

Bibliographic utilities provide bibliographic files that users can search and modify, for local use. The individual records stored in the data base originate either from network users or from various MARC tapes. Bibliographic utilities include: OCLC, Research Libraries Information Network (RLIN) and Washington Library Network (WLN), in the United States and University of Toronto Library Automation Systems (UTLAS), in Canada.

Bibliographic utilities began in 1971, when, after several years of preparation, OCLC went on-line. It offered libraries, not the centralised processing that had been heavily promoted during the 1960's but bibliographic information which they could purchase and use without sacrificing their independence or their internal operational control. Both the proffered product and the method of sale presented libraries with revolutionary new concepts to absorb.

Since that time, the other utilities have begun to offer services and the larger libraries have made steadily increasing use of them. The bibliographic utilities offer large libraries several advantages. The first, and most obvious, is access to sophisticated on-line computer technology that very few could afford to own.[55] A second advantage is that derived from sharing cataloguing input. If an item is already entered into a data base,

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[55] Richard De Gennaro, "The Role of the Academic Library in Networking," *Networks for Networkers,* ed. by Barbara Markusen and Blanche Woolls (New York: Neal-Schuman Publishers Inc., 1980), p.307.

there is no need to catalogue it a second time. The cataloguing information may be transferred to the user's file and adjustments may be made to it to suit the library's needs. The user may then produce various products showing this localised data. These products may include catalogue cards, book catalogues, COM catalogues or machine readable magnetic tapes.

A third advantage of using the bibliographic utilities is that per unit technical processing costs are reduced provided that the user has a fairly large number of items to process,[56] in spite of the fact that a fee is payable for each record obtained. This is due to the user's reduced labour requirements. At the same time, cataloguing quality is likely to be improved and new acquisitions should move through the technical processing area and reach library shelves, more quickly than in those libraries relying on manual systems.

These networks encourage other forms of sharing. They allow efficient and timely access to information about resources in other libraries so that inter-library loan procedures gain in efficiency. They also allow libraries greater flexibility in materials budget allocation because members sharing a network can pool resources. There is no need for all libraries to purchase all materials. Duplication of less used materials ceases to be necessary.[57]

Search Services

Search services such as DIALOG, System Development Corporation's ORBIT, the Bibliographic Retrieval Service (BRS), Canadian On-Line Enquiry (CANOLE) and QL provide many data bases or files, for users to search. In most cases, the files contain periodical citations. The vendors obtain the contents of the data bases from suppliers such as abstracting and indexing services and pay for them on a fixed and/or royalty basis. The user usually searches one file at a time and results are either printed on the user's printer terminal or, if the output is extensive, on the vendor's high speed printer. Printed output is then mailed to the user. User costs depend on the file selected and on connect time.[58] In a few cases, files contain the full text of articles, in others the citation or the citation

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[56] Miriam Drake, "The Economics of Library Networks," *Networks for Networkers*, ed. by Barbara Markusen and Blanche Woolls (New York: Neals-Schuman Publishers, Inc., 1980), p. 241.
[57] De Gennaro, op. cit., p. 306.
[58] Hank Epstein, "Network Technology Today," *Networks for Networkers*, ed. by Barbara Markusen and Blanche Woolls (New York: Neal-Schuman Publishers, Inc., 1980), p. 132.

and an abstract may be provided. Users may obtain lists of citations or full text. DIALOG, for example, will arrange to have requested articles mailed to users. If a user has an urgent need for the material, he may request that the results of the search be listed on his home printer, rather than wait for it to arrive by mail. This, however, is likely to be a very expensive method of obtaining information because of the communications costs involved.

Stand Alone Systems

"Stand alone" customised service networks include installed, turnkey circulation systems such as those sold by CLSI, Plessey, and ULYSIS. The systems are all minicomputer based and can be purchased complete with service contract. Other stand alone systems include DOBIS (Dortmunder Bibliothekssystem) and SPIRES (Stanford Public Information Retrieval System). These are both data base management systems which are maintained by the purchaser. The limitations of stand alone systems are that they may be restricted in what they can do (even within their particular area of specialisation), they may be incompatible with other systems and some are designed for small libraries. These latter may be found to have inadequate storage or computing power for the purposes intended.

Network Problems

The greatest difficulty facing networks and networkers is the lack of an implemented network standard. Such a standard would provide the ability of any network to communicate with any other. This could produce major savings for libraries in both equipment and communication costs. At present, difficulties include incompatibilities between various elements of the systems. For example, different systems may use a variety of terminals, communications lines, user search languages and strategies, and file and record management systems. A particularly troublesome aspect of the incompatibility problem is the variation in search strategy and language. This lack of conformity means that a user wanting to access several systems must learn a different set of rules and strategies for each one. Interfaces between the systems are therefore needed. They could reduce frustration and costs, and increase efficiency. Some design work has been done, by committees co-ordinated by the Library of Congress, toward the development of an augmented interface that would allow users to access all networks, using one

search system.[59]

AT&T is concerned with the technical aspects of the incompatibility problem. It has recently announced its Advanced Communication System[60] a value added network (VAN) which is designed for easy conversation between incompatible computers and terminals. In Canada, the Bell Telephone Company is presently developing its intelligent network, known as iNET which, it is hoped, will also provide a solution to the incompatibility problem.

Future Effects of Networks on Libraries

It has been suggested that networks will not only continue to develop and grow, as libraries begin to recognise the value of these tools as cost effective and efficient means of improving service, but also that they will lead to sweeping transformations of libraries, in the next decade. Some of the factors that will encourage this tendency are greater inter-library cooperation, reduced use of printed reference tools (as more information becomes available on line) and reduced employment of non-professional personnel.

It is expected that there will be an increase in the use of networks, not only as a result of the above mentioned trends but because of increased demand. This will occur as growing recognition of the need for life long learning and a continuing need for professional up-grading results in increasing university enrollments.

As technology becomes more versatile, increasing in power and decreasing in cost, many of the services which are presently centralised can be expected to become available at the local level, i.e. to the small and medium size library. This will result from the growing tendencies toward distributed computer networks, as well as the increasing use of stand alone systems. Distributed computer networks and stand alone systems are being made possible by the declining costs of computer hardware, increased communications capabilities, and by the availability of dependable and transferable network software systems.[61] However, regional and local systems will continue to be connected to, and make use of, the massive data bases maintained by utilities and vendors.

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[59] Ibid.
[60] "Settlement Frees A&T," *Bulletin of the Society for Information Science*, Vol 8, No 3 (February, 1982), p. 9.
[61] De Gennaro, op. cit., p.308.

Eventual use of the microcomputer as a home and/or library tool should allow the development of local networks involving individual library patrons. Consequently, new services that will be available to small libraries, will also be available directly to the patron, in his home. In fact, information banks are already accessible to microcomputer owners. Many changes in library service can be expected to result from this fact.

C. Videotex

Another technology that will encourage movement toward patron independence is videotex, which has close links with the microcomputer. Videotex is a communication system in which digitally encoded frames are transmitted for reception by a modified television set where a limited number of frames are stored and displayed. Most systems have color capability.[62] There are two kinds of videotex service: broadcast videotex, also known as teletext, and interactive videotex.

Teletext

Teletext converts the home television receiver into an information terminal. From 100 to 300 pages of information, displaying brief items of interest such as weather reports, news and sports scores are displayed on a repetitive basis. A viewer may use a keypad to obtain the information wanted, either by page number or by working through a tree search structure. The number of pages that can be made available is limited by the fact that retrieval is relatively slow: 30 seconds or more may elapse before the requested page is supplied, depending on the number of pages in the magazine.

Teletext is a public service in those countries in which it is offered. To receive it, subscribers require a television set with a decoding unit, either separate from the receiver or built into it. The information is stored in a computer and is sent as encoded digital data inserted into the vertical blanking interval (VBI). The VBI is spare signal carrying capacity in existing television broadcasting channels. The message is detected by the decoding unit and stored in the decoder's buffer memory. A microprocessor chip decodes the message and transfers it to the television screen. Although the originating television station needs an editorial department, to prepare and update the teletext pages to be stored in the computer, the service is inexpensive to provide in comparison with

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[62] Sam Fedida and Rex Malik, *The Viewdata Revolution* (New York: John Wiley and Sons, 1979), p. 172.

other broadcast services.

Teletext's greatest disadvantage is the limited amount of information that can be made available. As indicated, the number of pages is limited by the response time, but in any case, each page can carry only 21 rows of 32 characters. (In Europe 24 rows of 40 characters are possible because of differences in the transmission systems.) These limitations on the quantity of information that can be made available has been alleviated in France where a full channel is devoted to the teletext service. This allows as many as 5000 pages to be utilised with response times of 5 or 6 seconds.[63]

Teletext services are either available or under development in most of the European countries as well as Australia, Japan and the Americas. Britain was the originator of the technology and *Ceefax*, the BBC's service, has been available to the public, since 1974.[64]

Interactive Videotex

Interactive videotex employs two-way communication. The user specifies his requirements and single frames are transmitted to his receiver, where they are stored in buffer memory and then displayed. Most systems presently use the telephone network with a modem, although other means of transmitting information between computer and user include cable network, microwave link and satellite. Consequently, information carrying capacity is limited, under normal circumstances. This form of videotex provides still pictures, diagrams and/or text. It is a silent medium. It needs a large computer with vast storage capacity, which is programmed to permit quick access to and retrieval of information and to undertake all billing requirements. The user requires a keypad or keyboard, a decoder and a television receiver, as in the case of teletext.

Interactive videotex, although much more expensive to provide, has few of the technical barriers to information access that limit teletext. Potentially, it can make millions of pages of information available to its subscribers, although the tree search structure, presently being used, is not ideal. Although it appears to be a very simple method of retrieving information, it is not sufficiently subtle to allow complex searches. Key-word searching has been suggested but it would be very expensive to provide. However, videotex offers other services. Two-way communication can accommodate direct

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[63] Madden, op. cit., p. 54.
[64] Wicklein, op. cit., p. 75.

involvement of the user in the communication process. Consequently, enthusiasts foresee electronic messaging between users of the system, catalogue shopping, electronic funds transfer, polling of users, and facilities for reserving theatre or aeroplane tickets, from one's living room. Interactive videotex can also accommodate closed user groups. Thus, corporations or other organisations, such as libraries, could use the service as a computer conferencing facility.

Problems faced by videotex providers range from the infinite storage space required in the computer, to the number of users that can be accommodated at one time. A less severe problem involves the fact that homes, dependent on telephone lines for the receipt of the videotex service, will need some additional means of receiving incoming telephone calls.

Interactive videotex is too expensive to be provided free of charge. Consequently, one of the factors inhibiting development of this service has been uncertainty of the market. Although the public appears to be willing to pay for entertainment, as indicated by the success of such pay television enterprises as Home Box Office, its willingness to pay for information or any other of the services that videotex could provide, is still untested.

At present, the need for a cheap and efficient printer or facsimile copier has not been resolved and yet, it would vastly increase the usefulness of videotex services, if a hard copy could be obtained, of any information retrieved. An English company has developed a telefacsimile printer that can be coupled to a teletext system but this is still at the prototype stage.[65] Such an invention may eventually speed the development of electronic newspapers, electronic mail and, storage permitting, electronic libraries.

Telidon

Canada's Telidon is capable of operating in either one-way or two-way communication mode. It is the first system to incorporate advanced computer graphics and to permit the display of information on a user's screen, regardless of the way the data is stored in the computer. Thus, it can accept information from both the British and the French systems, whereas the reverse is not true.[66] These features plus the

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[65] *Access Newsletter: Bandwidth*, No 3 (April, 1981), p. 40.
[66] Efrem Sigel, *Videotext: The Coming Revolution in Home/Office Information Retrieval* (White Plains, N.Y.: Knowledge Industry Publications, Inc., 1980), p. 119.

sophisticated, high definition, alpha-geometric signal place Telidon far ahead of others in the field. Consequently, it is probable that Telidon will set the standard for North America. This supposition is strengthened by the fact that AT&T have agreed to an enhanced Telidon standard in co-operation with the Canadian Department of Communications.[67]

As a consequence of its greater sophistication, Telidon requires considerable computer memory to drive the display and has a microprocessor in its decoder. Thus, it can be thought of as a fairly powerful, home computer which lacks only a programme loading device and a full keyboard.[68] As these can be added relatively cheaply, videotex and home computer technology can be expected to merge. There is evidence to support this statement. A Telidon terminal is now being marketted that permits the user to call up colour graphics and text distributed in 20 rows of 40 characters or, to press a button and obtain 80 character lines,[69] Software exists that will allow the Apple II microcomputer to display Telidon graphics.

Telidon is still in an experimental stage. Field trials have been organised and several are still in operation across the country. There is a complex trial being undertaken by the Ontario Educational and Communications Authority which involves signal transmission over airwaves, via satellite and via telephone lines. There are three projects in Manitoba, one of which involves the use of optical fibre and one that is a commercial application of the technology, called 'Grassroots.' In Calgary, a project involving three libraries, Mount Royal College Library, Calgary Public Library and the University of Calgary Library is under development.

D. Two Way Cable Services

Two way (interactive) cable television will become a major competitor of *Telidon.* It employs coaxial cable and so does not suffer the limitations ascribed to videotex. Cable subscribers, if provided with a keypad and a suitably equipped receiver, can enjoy the same two-way communication advantage as videotex users, in addition to two-way communication during live transmissions.

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[67] "Telidon System Favored by U.S. Firm," *Canadian News Facts,* Vol 15 (Toronto: Marpep Pub. Ltd., 1981), p. 2519.
[68] Madden, op. cit., p. 57.
[69] John Syrett, "Implications of Videotex for Education." Unpublished paper, p. 8.

The fact that relatively few cable companies have attempted to provide this service stems from the same uncertainty of the market as limits videotex applications. The best known example of two-way cable is Warner Cable's *Qube*, which was launched, in 1977, in Columbus, Ohio. Subscribers to this system can play games, answer quizzes, register approval or otherwise of talent show participants, provide advisory votes on community issues and order movies and entertainment programmes. Qube provides 30 television channels: ten are for commercial or public television, ten are for 'premium' selections. (Most of these are movies, but one channel is devoted to 'soft pornography'.) The last ten are the 'community channels' which provide two-way communication. On these 'Qube Campus' offers credit courses, subscribers can vote on specific items and can make purchases. Qube is now expanding into Houston, Dallas, Pittsburgh and Cincinnati and has plans for a 120 channel service for several of the more affluent areas of New York.[70]

In the United States, only 50% of households presently have access to cable television but in Canada, as previously noted, 83% of all homes are within reach of such service. In Canada, however, development of cable services was restricted, by the CRTC which is concerned to protect Canadian culture from the competition from the United States that would be unleashed by unrestricted growth of the cable companies. However, pressure mounted, both from the public and the cable companies, and the CRTC, finally faced with the fact that satellites will expose Canadians to American culture, regardless of its rulings, has recently awarded contracts for the operation of 'Pay TV' services, to six cable companies.

E. Teleconferencing

Teleconferencing is another development that has arisen out of the capabilities of the latest advances in computer/communications technology. Teleconferencing is a means of facilitating communication that involves two or more individuals who are geographically separated. It provides a technical alternative to face to face meetings thus providing the possibility of saving both time and money. The three forms of teleconferencing are video, computer and audio conferencing although the technologies

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[70] Wicklein, op. cit., pp. 15 - 32.

involved may overlap in any one meeting.

Video Conferencing

Video conferencing uses television cameras and monitors. It is the most glamorous of the teleconferencing systems and attracts most attention. It is also the most expensive, and has garnered the most criticism. The question may be asked whether the video component is really necessary or whether it is, in fact, merely conspicuous consumption. Video conferencing was developed on the assumption that the closer the medium is to real life, the better the communication will be. This conclusion is, however, open to question. Personal problems, for example, may be less noticeable when using audio or computer conferencing.

TransCanada Telecommunications System has five conference rooms set up across the country, including one in Edmonton. Participants see each other and their voices sound as though they are all in the same room. Each place has an electronic stylus and a screen on which diagrams can be drawn. Illustrations can appear on all screens as they are made and facsimile transmission is available.[71]

The video conferencing systems are not being used as heavily as might be expected. The theatrical atmosphere inherent in video conferencing, the problems created by differences in time zones, the lack of privacy engendered by the knowledge that all conversations are being recorded and the fact that the system is expensive, both to install and to operate, are probably, all partly responsible.

Computer Conferencing

Computer conferencing could only develop once terminals became readily available and text-editing and time-sharing capabilities were an inherent part of computer use. Computer conferencing is the strangest form of teleconferencing. It is independent, not only of place but of time. Participants sign on at their convenience and can review what has gone before from their personal terminals. It is a very cheap method of meeting, being less expensive than either telephone or telex, over long distances.[72] Typically, 3 to 25 people are involved in a particular conference and all participants need hard copy terminals.

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[71] Ogle, op. cit., p. 260.
[72] Robert Johansen, Jaques Vallee and Kathleen Spangler, *Electronic Meetings: Technical Alternatives and Social Choices* (Menlo Park, Cal.: Addison-Wesley Pub. Co., 1979), p. 9.

Computer conferencing originally developed from the needs of committees for expert advice. It is often difficult to assemble experts together and there is the added disadvantage that an expert away from home, is also away from his resources. Through computer conferencing, experts can confer, check their data, call up various data bases, etc. Hard copies of proceedings are readily available and graphic, as well as textual, information can be made available to all participants.

Well established systems include PLANET and CONFER. PLANET is a conferencing program that was introduced by Info-Media. It was used by NASA to co-ordinate the use of the Communications Technology Satellite test centres, across the United States.[73] CONFER was developed by the University of Michigan and is used for education, committee meetings, seminars, and inter-university communications. Several conferences can take place simultaneously. This system is now available at the University of Alberta.[74]

The need to be able to type was originally seen as a disadvantage for users of computer conferencing but this has not proved to be the case.[75] A greater problem is the risk of information overload within the conference. The compensating advantages are: participants can enter the conference at a time and place that is convenient to them, time differences are not important and private, as well as public, communication is possible. For example, private comments can be exchanged or technical problems dealt with, outside the main conference.

Audio Conferencing

Audio conferencing is a sophisticated form of the conference call. Moveable table microphones, a set of speakers and preferably, good accoustical conditions are needed for successful conferencing. Some systems also have facilities for high quality telecopying. This allows copies of diagrams and documents to be exchanged. Dedicated lines are more expensive than regular telephone lines but they provide better voice quality.

NASA has the most extensive network of audio conferencing rooms. They were developed during the Apollo Project when contractors at geographically dispersed sites

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[73] Ibid., p. 10.
[74] "Computer Conferencing and the U of A CONFER Facility," *Bulletin*, University of Alberta, Computing Services, Vol 15, No 17 (25 August, 1981), p. 9.
[75] George Tracz, "Computerised Conferencing: an Eye Opening Experience," *Canadian Journal of Information Science*, Vol 5 (May 1980), pp. 11 - 20.

needed to be able to work together. The system is still in use.

The University of Wisconsin-Extension relies on audio conferencing for many of its adult education programmes. There are now 200 sites in the state, in such places as court-houses and public libraries, at which students may recieve courses. U/W-Extension claims to serve 25,000 students by this means. [76]

The University of Calgary is currently using audio conferencing for credit courses for those located in rural areas. Participants convene once, at the beginning of the course, to meet each other and the instructor, access the library and obtain texts. They then confer at regular hours, weekly. The professor can be in a studio or at home. Students can be located at several sites and can talk to each other as well as to their teacher. So far, 29 sessions have been offered this way, successfully. The latest development at Calgary is to make Telidon graphics available, by using the same carrier wave as is used to send the audio component. Back-up materials are obtained through inter-library loan and from the instructor, in the form of xeroxed copies.[77] The University of Alberta has offered two courses in educational administration to students in St. Paul and Bonnyville, by similar means.

Audio conferencing has been found to be most successful where people are separated geographically but have a task to complete. One of the problems associated with audio conferencing is the need for good accoustical conditions in conference rooms, especially when there is a large group. There may also be difficulties establishing the order of speaking because of the lack of visual cues.

The technology, in all types of teleconferencing, increases the possibilities for both good and bad outcomes for meetings. More pre-planning is needed and it is advisable to have the agenda agreed upon in advance, as well as the order of speaking, meeting times, etc. It is also preferable that participants do not come to the first meeting as total strangers.

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[76] Johansen, Vallee and Spangler, op. cit., p.13.
[77] Barry Ellis, "Teleconferencing at the University of Calgary," *Access Newsletter: Bandwidth*, No 3 (April 1981), p. 33.

F. Conclusion

As can be seen, application of the new technologies produces increasingly complex situations from which it is difficult to extrapolate trends and directions. These difficulties are increased by the fact that the underlying technologies are still evolving, so that nothing is reliably stable. Applications may vary, not only across the country but within a single organisation. The literature is complicated by numerous attempts to forecast trends which are almost inevitably proven to be inaccurate, within twelve months.

Videotex, for example, was originally designed as a home information system but it appears that business will make heaviest use of it and that as a home utility, it will achieve greatest use as an advertising medium. It was expected that teleconferencing would be a useful means of reducing meeting expenses but, in its computer conferencing form, it has been eagerly accepted by the scientific community, for the purposes of electronic information exchange and the experimental production of electronic journals.

The eventual elimination of incompatibilities between computer data bases will also affect the use of videotex and teleconferencing systems. This will further complicate the picture. Politics, economics and social influences will also influence application of the new technologies. Consequently, a full understanding of the effects of these developments would challenge the most conscientious student. It depends on an ability to remain constantly aware of changes and to fit them into the existing but, continuously shifting, mosaic of possible and actual applications.

Notes on Chapter 5.

Major sources of information used in this chapter are as follows:

Fedida, Sam and Rex Malik. *The Viewdata Revolution*. New York: John Wiley and Sons, 1979.

Networks for Networkers. Ed. by Barbara Markusen and Blanche Woolls. New York: Neals-Schuman Publishers, Inc., 1980.

Sigel, Efrem et al, eds. *Videotext: the Coming Revolution in Home/Office Information Retrieval*. White Plains, N.Y.: Knowledge Industry Publications, Inc., 1980.

Wicklein, John. *Electronic Nightmare: the New Communications and Freedom*. New York: Viking Press, 1981.

VI. Factors Affecting the Movement of Western Civilisation Toward Electronic Manipulation of Information.

A. Introduction

The use of advanced technology, in computer and communications applications, is leading Western civilisation toward the eventual electronic manipulation of almost all information. The increased speed of information transmission, the variety of communications media soon to be available and the new methods of storing and transmitting information, are all factors accelerating society toward the accomplishment of this goal. Although it is likely that the pace will be uneven, present indications are, that it will be achieved within the next twenty to thirty years.

In view of this, it is surprising to discover that a large percentage of the population appears to be relatively ignorant of the information explosion and the technological advances being recorded. In fact, few seriously expect major changes to occur within their lifetimes. Cohen has commented that there is very little awareness by the general public or the policy makers, of the nature of the information explosion or, of the urgency to devise policies to deal with it.[73] This is in spite of the evidence of increasing use of computers, discussion in the public media of such systems as Telidon and Qube and such inventions as the satellite.

Some of the reasons for the public's impression that technology has, to date, had little effect, may be that its invasion has been sufficiently gradual that it has been accepted and that it has not yet been identified as a major cause of social upheaval. It is also possible that expectations concerning the computer's ability to improve our lifestyle have been so great, for so long, that the population has become bored with waiting and is now prepared to treat all prognostications as idle fantasies.

However, among information scientists and communications experts, the feeling that progress is running ahead of man's capacity to interpret its implications and direct it into the most desirable channels, is becoming widespread. The new technologies are advancing by their own momentum, which is increased by political pressures and economic needs. Often, they are in use before their effects can be assimilated, so that

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[73] Dian Cohen, "The Information Revolution: a Call to Arms," *In Search*, Vol 17, No 2 (Spring, 1980), p. 8.

both ethical and social control are eluded.[79] And yet, many futurists are highly optimistic and have suggested that it is possible, now, to build a world that would eliminate human drudgery and at the same time, nourish the mind as never before.

In view of such conflicting views, it may be informative to study the factors that are likely to inhibit, or contribute to, progress in this situation. They may be divided into several categories and include: the technology itself, political and corporate influences, economics, the information explosion and social and psychological factors.

B. Exaggerated Expectations

In the early days of the computer's development, exaggerated claims were made for its future usefulness. Scientists trumpeted that the computer would defeat world chess masters, compose music, write novels and translate foreign languages.[80] When these marvels did not materialise, the public assumed that such developments would happen, only in the distant future and that they were not to be taken seriously.

In fact, however, in the fields of mathematics and science the computer did match expectations, so the assumption that all predictions grew out of the overactive imaginations of computer scientists, was a mistake which may yet result in severe cultural shock, and may itself inhibit technological advance.

C. Technology as a Positive Force Toward the Information Age

Technology is the strongest positive force in the movement toward the information age. Research is continuing and has, probably, never been more vibrant than it is today. This is substantiated by the stream of technological innovations witnessed during the past ten years and the fact that there appears to be no slackening of the pace, at which advances are being achieved. Researchers claim that the integrated circuit will continue to get smaller, more efficient and more powerful. Technology promises more powerful satellites, able to carry more television channels, more cheaply, than is

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[79] *Many Voices, One World: Communications and Society Today and Tomorrow*, (Paris: UNESCO, 1979), p. 32.

[80] Marvin Dencoff, "Sophisticated Software: the Road to Science and Utopia," *The Computer Age*, ed. by Michael Doutozos and Joel Moses (Cambridge, Mass.: MIT Press, 1980), p. 368.

presently the case. Television screens are about to be improved[31] and the laser is becoming as ubiquitous as the integrated circuit. The latter is responsible for a new generation of technical improvements to the communications media, ranging from its involvement in optical fibre communication lines and direct laser beam transmission, to its use in videodisc reading, laser printers and holography.

D. Technological Limitations

There are various technical factors inhibiting the development of the electronic society. The most obvious of these is the limitation imposed on communications by the transmission capabilities of the 'plain old telephone service.' Although a great deal of research has been applied to improving the information carrying capacity of copper wires, the fact remains that the wires that link a home to the telephone network were, originally, intended to carry analogue signals. They are not well suited to carrying either video or digital messages. Although digital data can be transmitted with the aid of modems at either end of the line and graphics can be transmitted to computer terminals or videotex equipped television sets, both processes are slow, inconvenient and, in some cases, expensive.

A large percentage of the homes in North America have access to cable television but coaxial cable lacks the versatility of the telephone network because subscribers cannot contact each other except through the company's computer – an expensive process. As a consequence of these limitations, massive expenditures will be needed to upgrade the nation's electronic highways, if people are to be able to access large data bases to obtain printouts of information, or gain access to games, movies, educational programmes or each other, at reasonable cost. Business and government also need to be able to transfer large amounts of data, quickly but until optical fibre or some other superior technology, replaces copper wires, these applications of the telephone network remain impractical.

A further gap in the technology, as noted earlier, is the lack of a cheap, efficient, electronic, home printer. Access to electronic mail, electronic newspapers and electronic libraries will be regarded as interesting possibilities but of limited usefulness until a

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[31] "Small is Beautiful!" *Bandwidth*, No 5, (December, 1981), p. 69.

speedy means of obtaining a hard copy of information requested, becomes available. It will also be necessary to reduce both capital and communications costs.

A deficiency, that is likely to take longer to correct, is the computer's lack of ability to handle natural language exchanges. Users must follow a system's protocols and specific command language and must do so precisely. Consequently, it is unlikely that the public will make much use of general purpose computers for such purposes as searching a data base, or using a computer programme to resolve a specific problem, in the near future, except through such means as a keypad which permits only monosyllabic responses, or a human intermediary.

The technology, therefore, while forging ahead and producing ever greater marvels, is leaving gaps behind it that hinder application. The weakness of the electronic highway, the difficulties of communicating with a machine and the lack of such basic equipment as a good, home printer are responsible for much of the public's present, apparent lack of appreciation.

E. Political and Corporate Influences

Political and corporate influences are also contrapuntal. From time immemorial, governments have feared universal access to information and all have attempted, by various means, to control the communications media. Nevertheless, these same governments have been anxious that such facilities should be available. In the early nineteenth century, England imposed a tax on newspapers, thereby limiting their circulation to the wealthy, who could be trusted to support the *status quo.*[82] In the United States, early radio stations were prevented from providing anything more than the briefest outline of the news of the day, in an attempt to protect the newspaper industry.[83]

Pressure from the American telephone companies resulted in the Communication Satellite Act, of 1965. This Act ensured that satellites would be used only for the international transmission of information, thus temporarily safeguarding national

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[82] James Martin, *Telematic Society: a Challenge for Tomorrow* (Englewood Cliffs, N.J.: Prentice-Hall, 1981), p. 11.
[83] Ibid.

terrestrial communication networks[84] but delaying improved inland information transmission.

Cable television provides another example. In the United States, cable television was limited to those areas in which it would provide least competition for the three major networks. The Federal Communications Commission consistently legislated against the cable companies, decreeing that there should be no competition with local television stations, no original programming and no old movies. It was not until 1968, that these regulations were eased.[85]

In Canada, the CRTC could not prevent the introduction of cable television without facing major popular opposition. The signals originated in the United States and were easily picked up by the Canadian cable companies. However, the CRTC did attempt to ensure that some channels were reserved for community programming purposes.

The CRTC's latest efforts to prevent cultural colonisation, by the United States, have been in the area of 'Pay Television.' The arrival of this service has been delayed several years in the belief that a bank of Canadian programmes could be built up, that could be used as a buffer to the American influence. This state of affairs might have continued but for the advent of the domestic satellite and the rapidly growing, earth station manufacturing industry. These made further delay pointless.[86]

Attempts have been made to legislate against the private ownership of earth stations but to date, none have been successful, although cases are still pending in Manitoba and Newfoundland. Such laws would, in any case, be difficult to enforce in a democratic society. As Neil Webber, Associate Minister for Alberta Telephones, was heard to say, "...it would take the Soviet army to police a law forbidding private use of earth stations."[87] This situation is a clear example of technological advances running ahead of civilisation's ability to absorb them and ensure their most advantageous application.

The United States is in the process of deregulating its communications companies, ostensibly because a free market will achieve the best possible use of the new communications systems, in that companies will be forced to react to public pressure. In

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[84] Wicklein, op. cit., p. 160.
[85] Martin, op. cit., p. 34.
[86] Fil Fraser, "Pay Television and the Revolution in Communications," *Interface*, Vol 5, No 2 (February, 1982), p. 19.
[87] "Provinces Gain Satellite Points," *Edmonton Journal* (12 September, 1981), p. B3.

fact, corporate influence can be recognised.

Considerable reserve is felt about this idealisation of the market place, on both sides of the border. In Canada, a battle is being waged between the cable companies and those who wish to maintain a content/carrier separation, in the interests of assuring high quality programming that will cater to all interests, rather than that defined as belonging to the 'masses'. The cable companies are mobilising their resources to prevent regulation which would mandate this separation because it would limit their power and reduce their sources of revenue. At the same time, the telephone companies are claiming the carrier role as their right and present indications suggest that there is some support for this position, from various levels of government and, from the CRTC.[18]

Thus, it can be seen that political and commercial pressures interfere with the immediate application of technological advances and, in Canada, this has been particularly clearly illustrated. However, such pressures provide a safeguard against thoughtless methods of implementation that may, later, be found to undermine the democratic process.

F. Costs and Economics

Costs and economics play a complex role in the encouragement of the new technologies. The market place may either encourage or inhibit new developments. Corporations will promote new technology in which they have a financial interest, such as microcomputers or videotape recorders. They may also inhibit new developments in an effort to protect an investment in old equipment or old methods that will be made obsolete by the new advances. For example, AT&T has a depreciation schedule of 30 years on much of its telecommunications equipment.[19]

For members of the public, different considerations arise. For electronic equipment, of the types available today, to be commercially successful ventures, the buying public must be able to see the fulfilment of a need, general usefulness, or an increase in convenience or pleasure to be derived from the item under consideration for purchase.

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[18] Fraser, op. cit., p. 21.
[19] John Barrentine, "The Future of Computer Technology in Library Networking," *Networks for Networkers*, ed. by Barbara Markusen and Blanche Woolls (New York: Neal-Schuman Publishers, Inc., 1980), p. 145.

At this time, many electronic inventions are too newly emergent from the hobby market, to be considered as popular consumer items. The microcomputer is a good example. Until very recently, it was still seen by the general public as an electronic engineer's toy that, at prices that ranged in the thousands of dollars, was not an attractive purchase. It apparently fulfilled none of the criteria listed above so far as the average citizen was concerned.

The earth station suffers similar problems. Although the usefulness is apparent, several thousand dollars for the pleasure of watching numerous television channels, most of which are likely to be offering movies, quiz shows, sports and soap operas, is exorbitantly expensive.

Costs will also affect the degree to which videotex and cable services will be accepted. In England, Prestel, which charges for specific services, has not been universally embraced by the public and is chiefly used by business. This may be due to the possibility that set monthly charges are preferable to itemised listings of costs. In England, where each local telephone call is charged to the subscriber, only 60% of households have telephones.[90] In North America, where a set charge is made once a month, that covers all costs, except long distance calls, the market is saturated.

The increasing cost of paper is another economic factor favouring the electronic manipulation of information. Electronic access to a particular item of information allows major economies not only in paper used, but in distribution costs.

G. The Information Explosion

A further positive influence on the movement toward the electronic manipulation of information is the so called 'information explosion.' This began with the first products of the printing press which foreshadowed exponential growth in the numbers of books, journals and other printed materials, produced.

According to some estimates made by international bodies, in the fields of science and technology alone, in the 1970's, more than two million scientific writings were issued every year. Another estimate claims that the number of technical journals

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[90] Fedida and Malik, op. cit., p. 2.

published throughout the world exceeds 100,000.[91] The *Bowker Annual* indicates that 33,737 books were published between 1979 and 1980 in the United States[92] and *Books in Print* for 1980 – 1981 lists over half a million titles that are currently available. The problem of organising and storing such vast quantities of information is compounded by the costs involved in acquiring so much material.

The information explosion is a contributing influence toward the advance of the electronic society. New means of storage, organisation and retrieval of information are a necessity. It is no longer feasible to have the world of knowledge available to any particular individual, in printed form, in spite of the best efforts of the best libraries. Print on paper belongs to the industrial era when: advances in technology and growth of information came more slowly, paper catalogues and indexes were able to provide an adequate means of organisation and retrieval, and libraries could provide quick access to information.

Today, not only is there more information, there is less time. Scholars are no longer cloistered and able to spend their lives in isolated and leisurely pursuit of a particular idea or concept. They must be as competitive as any other professional or business person. They are expected to keep up with the latest developments and theories in their particular fields of expertise and to contribute to these new developments. Trudging through libraries, searching for materials that have not been acquired, are lost or are on loan to another borrower, limits the scholar's productivity and lowers his value to his profession, to his employer and to society.

The need for improved efficiency in the storage and retrievability of information, of all kinds, is already urgent. Professionals must be aided in their efforts to keep aware of the developments in their fields of practice. Businessmen need immediate information on everything, from political events that may affect the market or productivity, to stock prices and research developments that may necessitate changes of company policy. The general public must be knowledgeable to exercise the franchise in their own best interests and young people, born into this brand new, electronic world, must be given every chance to survive in it.

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[91] *Many Voices, One World: Communication and Society Today and Tomorrow* (Paris: UNESCO, 1980), p. 94.
[92] *The Bowker Annual of Library and Book Trade Information*, 26th ed. (New York: R.R. Bowker, 1981), p. 326.

Some attempts have been made to try to accommodate the information explosion. Vendors such as DIALOG and CANOLE provide access to data bases such as MEDLINE and Compendex (Engineering Index) which provide listings of periodical articles by author, title, and subject. Most vendors arrange to provide hard copies of particular articles on request. There are also data bases that provide similar access to newspapers. Examples are the New York Times and Info Globe. Computer networks, such as The Source and Compuserve, provide similar services as well as access to financial information and advice, computer programmes, educational materials, electronic mail and various sources of entertainment, such as games and quizzes.[93]

Such information sources imply a major step toward the electronic storage and retrieval of information but the need is for full-text storage and immediate retrieval. The inhibiting factors here are not only the expenses of storage and of searching the data base, (which may be comparatively cheap in terms of time saved and frustration avoided) but the cost of transmission of the material retrieved, as previously noted.

Print, however, is only one aspect of the information explosion. Video information is being produced in vast quantities. The world produces several hundred hours of new television programmes every day[94] and this will grow, at an exponential rate, as the opportunities offered to the television industry, by the new communications developments, are recognised. Much of this information is shown on public television once or twice and then relegated to the archives of owner institutions, such as the CBC or BBC. From there, it is unreachable because it is forgotten. For these materials, some form of access should be provided.

Other forms of information are also moving out of the novelty area, into a growth situation. These items include educational television programmes, courses on videodiscs and videotapes and computer software. Even if these could not be borrowed freely, the fact that they exist should be in the public domain so that they can be obtained by those who need them.

The ideal solution would be electronic access via a library or computer data bank. Such a system would, however, require a video network linking film libraries, production studios, universities and homes. This is another instance of the present inadequacy of the

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[93] "Source Book," *Time*, Vol 116, No 28 (9 July, 1979), p. 44.
[94] Martin, op. cit., p. 97.

electronic highway. Such a network does not exist and would be very expensive to install, although the advent of the satellite or, possibly, of fibre optic cabling will eventually, make such networks feasible. The intelligent network, presently being studied by the Bell Telephone Company and others, may also aid this situation.

As indicated, the information explosion is an almost wholly positive force for the development and expansion of access, by electronic means, to the world's knowledge but it is not a glamourous or attention rivetting phenomenon. Consequently, the strength of the influence of the information explosion is limited by its lack of pubic appeal.

H. Negative Social and Psychological Factors

The most important of the social and psychological factors inhibiting technological developments are: fears of loss of basic freedoms, of loss of employment, of the effects of computer crime and of the difficulty of proving computer error. Other inhibiting factors include public inertia, bureaucratic red tape and certain social and religious groups which tend to be conservative in their approach to change, preferring to support stabilising influences.

The fear of an authoritarian state is valid. No politician in history has had the power of communication available to him, that exists today. The need for a variety of communications channels to combat the risk of control should, therefore, generate a positive force, for the advancement of civilisation, into the electronic information age. In Russia, where there are few television channels and no local television stations, control of the medium is straightforward.[95] Control of Western media is much less simple because of its diversity. Nevertheless, the spectre of 1984 is disturbing, to a large percentage of the population.

Concentration of ownership of the media, in fewer and fewer hands, is causing anxiety in many countries. Concentration operates in three ways: horizontal and vertical integration of enterprises connected with information and entertainment, the involvement of other enterprises in media concerns and the merging of information industries into large scale, multi-media conglomerates.

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[95] Ibid., p. 195.

Such concentration can be seen in many of the industrialised countries. In the United Kingdom, by 1970, five companies accounted for 71% of daily newspaper circulation, 74% of commercial television production, 78% of cinemas, 70% of paperback sales and 65% of record sales.[96]

The Kent Commission[97] indicated that Thompson Newspapers Ltd. reported owning 52 newspapers in Canada, as well as an equal number outside the country, and was also engaged in wholesaling, retailing, real estate, oil and gas, insurance and various high technology enterprises. Torstar Corporation reported ownership of the *Toronto Sun*, Comac Communications Ltd., Harlequin Enterprises, Nelson Fern International, a 50% interest in Infomart, and part ownership of *Today Magazine*.

Concentration of ownership is promoted by the growing integration of the communications industry. The press, radio and television, as well as the computer/communications industry, share the same technology. All require large capital resources and so tend to become units in one gigantic machine.

Many see these developments as a threat to the existence of the free press and to freedom of thought and expression. Others feel that concentration should not be viewed in a simplistic way but in terms of the total volume of information made available. In some cases, mergers lead to the dissemination of more abundant and more diversified information. There is also the possibility of greater efficiency.[98]

The Privacy Problem

A second, related anxiety is the fear of loss of privacy. Computer data banks contain enormous amounts of information about the citizens of western countries. This ranges from financial information collected by governments, credit bureaux and employers, to medical information collected by medicare systems, to consumer information collected by department stores, to records compiled by police, insurance companies and even libraries.

Although all these data banks were set up from purely altruistic motives, such as the desire to improve living standards, protect society, improve convenience and

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[96] *Many Voices, One World: Communication and Society Today and Tomorrow* (Paris: UNESCO, 1980), p. 105.
[97] *Canada. Royal Commission, Royal Commission on Newspapers* (Hull, Quebec: Supply and Services, 1981), p. 90.
[98] *Many Voices, One World: Communication and Society Today and Tomorrow* (Paris: UNESCO, 1980), p. 106.

efficiency, etc., they represent a threat. The fact that these records are unprotected by privacy legislation could become extremely menacing to the individual citizen. Human inefficiency has provided a safeguard, of sorts, to individual privacy, in the past but the computer is efficient. It can index, cross reference and store everything. And electronic funds transfer will aggravate this situation. Consequently, it is likely that safeguards against the invasion of privacy will be demanded, in most Western countries, in the near future.

Fear of Loss of Employment

Fear of the loss of employment and, therefore, of the ability to earn money, is also an inhibiting factor that has some validity. In 1971, the percentage of the work force in 'blue collar' occupations, in Canada, had dropped to 25.6 from 31.6 in 1951,[99] and yet, according to Irving Whynot of the Canadian Bankers Association, although banks have automated many of their functions and are now installing automatic tellers, employment in banks has not been reduced. Banks employed 92,500 people in 1970. In 1981, they employed 155,737.[100] (He failed to mention, however, that this figure has remained steady, since 1979.) Japan is rapidly converting its factories, from the employment of people, to the use of robots but claims that displaced employees are absorbed into other areas of the companies involved.[101]

Labour unions have long feared the process of automation and have, fairly consistently, inhibited its application to the work place. Canada's postal workers' antagonistic response to automated sorting equipment illustrates this. In England, factories have been forced to use antiquated equipment, long after there was any need to do so, by union militancy generated by fears that jobs would be lost.

There is now some controversy as to how much unemployment computers and automation will generate. There is a growing demand for software, video programmes, teaching materials, courses and computer programmes. Consequently, many may find new careers in these areas. Within the last ten years, the electronics industry has generated 3 million new jobs in the United States. The manufacturing industries have not

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[99] Canada. Statistics Canada. *Canada Year Book 1978 - 79: an Annual Review of Social and Political Developments in Canada* (Ottawa: Supply and Services, 1978), p. 364.
[100] Dennis Hryciuk, "Automation vs Just Plain Folks," *Edmonton Journal* (18 February, 1982), p. E7.
[101] "Look no Hands: Yamazaki Machinery Works' Computer Controlled Plant in Japan," *Time*, Vol 118, No 20 (16 November, 1981), p. 89.

increased their capacity to employ, during this time.[102]

Distrust of Computers

A third psychological factor inhibiting desire for the application of the new technologies, is public distrust of computers. Not only is the public occasionally informed of massive thefts from banks or corporations, by electronic means, it is convinced that very few such thefts are brought to its attention. Computer crime is feared, not only at a personal level, but because of the potentially massive nature of financial thefts, for the possibility of adverse effects on a country's entire economy.

Fear of computer error is also part of this distrust. Occasionally, a newspaper article will highlight some massive error; such as an utility bill for millions of dollars. This adds to, and provides validation for, this distrust. Worse animosity, however, is generated by small errors that clerks are either unwilling or unable to correct. The concomitant fear is that the next error will involve a larger sum and that a complaint will be met with equal disinterest on the part of the owner of the offending machine.

Conservative Influences

Some social and religious leaders also tend to prefer not to disturb the social fabric. New ideas and new knowledge generated by computer/communications facilities, tend to disturb public equanimity and access to complete information, limits the amount of duplicity to which the public can be subjected. Martin makes the point that the 1848 social upheavals that rocked Europe, coincided with the first year that daily newspapers were generally available.[103] In North America, the upheavals of the 1960's coincided with the first decade in which the majority of the population had access to television. The introduction of two-way communication, via videotex or through computer networks, may also generate discontent and disturbance although the communication, being bi-directional, may provide its own safety valve. In view of these facts, the tendency to encourage delay of the implementation of new communication services, is understandable.

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[102] Alexander L. Taylor, "Striking It Rich," *Time*, Vol 119, No 7 (15 February, 1982), p. 42.
[103] Martin, op. cit., p. 49.

I. Positive Social and Psychological Factors

Social and psychological factors that may contribute to the acceptance of the new technologies include convenience and ease of use, and entertainment and enjoyment.

Convenience and Ease of Use

The ability to buy or sell items, from a catalogue or from a classified advertisement, from one's living room, would have strong appeal to those who hate crowds, resent spending leisure time shopping or dread driving on icy roads. However, the self-discipline involved in controlling such spending habits may create problems.

Convenience, such as that described above, will probably be a major factor in encouraging the development and acceptance of the new technologies. The ability to obtain goods and services, from the home, that would presently involve the expenditure of time and the acceptance of major inconvenience in the form of long waits for service or the frustration involved in wasted journeys, would be viewed with delight, by those whose time is precious.

The ability to become involved in community affairs, from one's home, would be such a convenience. Cable television companies, in the United States, have indicated much greater involvement in town meetings, when they were made available by cable. Wicklein describes such a meeting in Columbus, Ohio, in which 2000 people participated.[104] However, some fears have been expressed concerning the possibility of polling the public, by this means, in order to decide civic, provincial or national issues. The risk of decisions being based on emotional or ill-informed responses, is cause for alarm. A further cause for doubt about the validity of such voting systems is raised by the fact that there is no means of knowing who is registering a vote. Three year olds in Columbus have been known to 'touch in' on request.

The possibility of working at home generates both positive and negative influences, among the public. Working at home would save commuting time, reduce environmental damage from gasoline pollution, conserve energy and allow any individual considerable freedom to organise his time to suit himself. It would also provide a need to make major adjustments, both mental and emotional.

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[104] Wicklein, op. cit., p. 35 -26.

More self-discipline is required to work at home than is needed in an office or other place that is associated with a working atmosphere. The presence of children would be very distracting and spouses, who enjoy each other's company for two days per week, might find it a greater strain to be together, constantly. A situation that would present equal difficulties is that in which an individual lives alone. To lose the social contacts generated by the work place could be extremely depressing and mentally stressful.

Entertainment and Enjoyment

One of the factors likely to have an encouraging influence on the technological revolution is the insatiable public appetite for entertainment. Vast markets exist for both hardware and software that will allow the public to learn, watch, listen, interact or play games. The obviously lucrative nature of this market is not lost on those in a position to supply it with solutions to both present known and, future contrived, needs.

J. Conclusion

Some of the psychological and social influences inhibiting the application of the new technology are not directly connected with information storage and retrieval. However, factors which impede the development of any aspect of the new communications, can be expected also to inhibit the electronic manipulation of information.

To this point, inhibiting factors appear to outweigh those encouraging the movement toward the electronic age. Politics and lobbying by conservative groups and vested interests, public ignorance and the hesitant attitudes of regulatory agencies could delay, if not prevent, the full benefits of the technological information era from coming to fruition. And yet, positive influences are powerful. They include: the increasing availability of the technology at steadily decreasing cost, the information explosion and the strong public desires for convenience, increased leisure and variety of entertainment.

Public lethargy has been blamed, by some people, for slow acceptance of the new technology. However, this may also be seen in another light. New services and equipment are often accepted casually, without concern for their long term effects or deeper connotations. When citizens in Columbus, Ohio, were asked if they were

disturbed by the fact that their responses were recorded on a computer, the majority indicated that they were not.[105]

Public lethargy is encouraged by media discussions of new technological breakthroughs whose application may take years. Telidon has received much publicity but most Canadians have access only to a few commercial television channels. It is only within the last few months that earth stations have become available to those who can afford them and the microcomputer is only, slowly, moving out of the hobby market, except for business applications.

This situation generates a false sense of stability because advances are occurring. As noted, the CRTC has awarded contracts to some cable companies, to establish pay television channels and two-way communication services. Many Telidon field trials are drawing to a close and general application of the technology should follow rapidly, if these trials are successful. The integrated circuit is appearing in cars and appliances of all sorts and some people are already working at home, rather than commuting to an office every day.[106]

Thus, although forecast changes resulting from the new technology, are not clearly visible, although no headlines proclaim the arrival of the shortened work week, of distance education or of the cashless society, many of the changes forecast by such futurists as Toffler, Martin and Evans, are occurring and quietly, unobtrusively, affecting society's behaviour.

To assume that libraries will be unaffected is to be wilfully blind. Many are already producing computer based catalogues, working with computer based circulation systems and consulting computer based indexes. The large libraries are taking full advantage of the technological revolution.

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[105] Ibid., p. 27.
[106] Alvin Toffler, *The Third Wave*, (New York: Morrow, 1980), p. 213.

Notes on Chapter 6.

Major sources of information for this chapter were:

Many Voices, One World: Communication and Society Today and Tomorrow, Paris: UNESCO, 1980.

Martin, James. *The Telematic Society: a Challenge for Tomorrow*. Englewood Cliffs, N.J.: Prentice-Hall, 1981.

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VII. The Influence of Informatics on the Life Styles of Library Patrons.

A. Introduction

Rezler has stated that, "Since the 1950's, automation has been spreading at an accelerated rate, both in horizontal and vertical directions in all areas of the American economy."[107]

The effects of the adoption of technological innovation are pervasive, not merely affecting work methods but affecting the whole structure of society. Employment, a foundation stone of civilisation, is being undermined by technology and as a consequence, the economic and social structures are becoming equally unstable. Increased free time for a large percentage of the population, while apparently an unalloyed good, on second consideration may be a cause for concern. The need to learn responsible use of leisure is increased, as other values are undermined. Education is faced, not only with unprecedented demands for professional up-grading courses and seminars but general interest, continuing education opportunities, as well as the implicit demand that it provide a foundation on which society can build new philosophies and values. Libraries will be required to support these efforts.

B. Library Patrons

Although there are no clear cut distinctions between those who use libraries and those who do not, library patrons tend to share certain characteristics and to have these to a greater degree than non-library users. They can be expected to be book lovers, to enjoy reading for pleasure and enlightenment and to spend some portion of their free time reading books [108] as distinct from magazines and other ephemeral material. Many can also be expected to buy books.[109] They tend to encourage their children to use libraries,[110] to respect learning and to be interested in other cultural activities.

Public library patrons tend to make heaviest use of biography, fiction, and

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[107] Julius Rezler, *Automation and Industrial Labour* (New York: Random House, 1969), p. ix.
[108] Project Progress (Ottawa: Canadian Library Association, 1981), p. 50.
[109] Ibid., p. 51.
[110] Ibid., p. 57.

instructional materials related to home activities of all sorts.[111] These range from cookery to handyman projects. Academic and research library patrons are nearly all students and teachers, directly involved in formal education. They can be expected to be well educated, to be well informed and to need access to large collections of scholarly materials.

Conclusions that can be drawn from the above are that library users tend to be intelligent, have some disposable income and leisure to pursue their interests. The majority will therefore belong to the middle class (71% of university graduates use libraries but only 15% of those with grade eight education or less, do so).[112] Nevertheless, they are also likely to be heavily influenced by the new technologies and to increase their demands on libraries and educational institutions, as their free time increases.[113]

C. Employment

A major aspect of the lifestyle of western civilisation, that is presently being affected by the impact of the computer/communication revolution, is the employment situation. The current concept of work as a full time, daily commitment is already passing. Many researchers have commented on the decline of the work ethic. It has been noted that there is a general decline in the zest for work, even among professional and intellectual workers.[114] Leisure is no longer regarded as a privilege, but as a right. Evidence of this can be seen in the various experiments with three and four day work weeks and flexible scheduling. It is also noticeable in the trades unions' resistance to these arrangements, in favour of reduced hours, although this is also influenced by the felt need to share the work available.[115]

Such apparently revolutionary changes may, in fact, be seen as a natural historical development. Hours of labour in Canada have declined, from 54 to 60 hours per week in

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[111] Ibid., p. 51.
[112] "Libraries can Grow as Book Source," *Feliciter*, Vol 27, No 5 (May, 1981), p. 1.
[113] Ibid., p. 94.
[114] Joseph B. Rose and David K. Banner, "Major Work/Leisure Trends and Some Implications of the Shorter Work Week on Leisure Time," *Three or Four Day Work Week*, ed by S.M.A. Hameed, and G.S. Paul (Edmonton: Faculty of Business Administration, University of Alberta, 1974), p. 157.
[115] Colin Hines and Graham Searle, *Automatic Unemployment* (London: Earth Resources Research, Ltd., 1979), p. 44.

1900, to 42 hours in 1961,[116] to the current usual 35 to 40 hour week. According to Nanus and Adelman, this trend will continue, as will the trends to longer paid vacations and earlier retirement.[117] Although acceptance of these prophecies is not universal and it is apparent that hours of labour have not declined greatly in Canada, over the last two decades, historical trends, popular inclination and technological innovation provide fairly strong support for their likely fulfilment. It has been suggested, somewhat cynically, that once leisure is recognised as a component of the gross national product, there will be little nervousness in reducing working hours.[118]

The pessimistic view of changes to come in the employment situation is the expectation of large scale unemployment, as a result of the impact of automation in secondary industry and informatics in the tertiary sector. The employment capacity of the primary industries has already been greatly reduced, having sunk from 19.8% of the work force in 1951 to only 7.5% by 1971.[119]

Studies show that information handling constitutes 50% of the work of the service sector, so that the effect of informatics will be concentrated in this area. As this sector has, until recently, provided a buffer to unemployment, this fact may have far reaching repercussions. It is notable that, within the last few years, its ability to absorb recruits has declined. Growth achieved in the clerical sector between 1975 and 1979 was only 25%, in comparison with a growth rate of 34%, for the period 1971 - 1975.[120]

Such innovations as automatic bank tellers, communicating word processors and point of sale systems will reduce employment opportunities for clerical and retail workers, just as the use of robots will reduce employment opportunities in the manufacturing sector. The use of computer terminals for access to, manipulation and retrieval of, information and teleconferencing in all its forms, should also reduce the time needed for professional, administrative and managerial tasks.

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[116] Rose and Banner, op. cit., p. 134.
[117] Burt Nanus and Harvey M. Adelman, "Work and Leisure. 1980," *Business Horizons*, Vol 14. (August, 1971), p. 7 - 8.
[118] Rose and Banner, op. cit., p. 157.
[119] Canada. Statistics Canada, *Canada Year Book 1978 - 1979: an Annual Review of Economic, Social and Political Developments in Canada* (Ottawa: Supply and Services, 1979), p. 364.
[120] Heather Menzies, *Women and the Chip: Case Studies of the Effects of Informatics on Employment in Canada* (Montreal: the Institute for Research on Public Policy, 1981), p. 12.

Thus, it appears fairly certain that the final effects of automation will be to reduce the number of jobs available. This will not be as a result of mass firings but of the gradual elimination of jobs, either through attrition or by moving employees out of areas where they are no longer needed, into other sections of the organisation.

Reduced opportunities for employment resulting from the influence of technology have, to date, caused only minor protestations. Occasionally, writers note that an industry now employs fewer people than it once did but the effects of technological innovation on the market place, have not been clearly delineated.

The Canadian Bankers Association claims, for example, that the new technology has increased the banks' ability to provide service and that this has led to increased staffing. However, as noted, since 1979, employment figures have not increased greatly, and this may mark the beginning of a decline in the needs for staff, as technology increases in power and capability.[121]

The public is constantly reassured that people are not losing their employment as a result of automation, but are being relocated. The fact remains, however, that some jobs are ceasing to exist. High turnover and the movement to part time work, especially in the clerical and retail areas, has helped to hide the effects of this situation.

Some compensation for decreased employment opportunities is being provided by the technology. Although the computer can perform a given task more quickly and efficiently than a human being, it may be required to do much more. It may, for example, test many more situations than its human counterpart would be required to do, in the name of improved design or production techniques, etc. This increased workload may prevent reduction of manpower. As in the case of Canada's banks, new technology may allow an organisation to increase production so that individuals displaced by the computer's efficiency are needed in other areas, to minimise the stress and strain imposed by increased output. A third area in which the new technology is providing employment is those industries that either support the technology itself, or have developed as a result of innovative uses of it.

Nevertheless, whether future work reduction is viewed from the negative side as permanent unemployment, or more positively, as an opportunity for creativity and

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[121] Menzies, op. cit., p.47.

personal development, a period of mental and emotional adjustment to this situation will be needed.

If the new forces released by automation make our current concept of work obselete, they will pose a direct threat to the function and status of the individual and hence, initiate a change in the whole social system and structure of values. Work is basic to our institutions and to our social dynamics. A dominant value of our society today is the acquisition of material wealth, so that the psychological necessity of work is not only in intrinsic, individual satisfaction, it is a primary means of social evaluation. It is the main social mechanism whereby individuals relate to each other. To be deprived of work, in our society, is the equivalent of becoming a social outcast, so that the elimination or reduction of work, will require a nation-wide mental and emotional adjustment to a new system of values, alternative status symbols and new vehicles for relating to each other.

The introduction of the reduced work week may aid this process of adjustment and may provide a natural path toward Toffler's home centered economy. The fact that computer/communications technology will, not only reduce the amount of work for people to do, but also allow much of what is left, to be done from the home, may help to alleviate the problem induced by the stigma associated with unemployment.

If the cottage industry and home centered society materialise, as Toffler has suggested that it will, de-urbanisation and de-centralisation will be encouraged. Several advantages could accrue from such a movement. Not only will the elimination of travel time shorten the working day and reduce energy consumption and pollution, it should lead to the development of greater community stability, fewer transient human relationships and greater participation in community affairs.[122] Gradual changes, such as are implied here, will avoid sudden increases in free time for large sectors of the population and so will provide an opportunity for those organisations involved with leisure and education, to adjust to the probable future excessive demands of the public on their facilities. Libraries will be affected in both of these areas.

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[122] Alvin Toffler, *The Third Wave* (New York: Morrow, 1980), p. 220.

D. Leisure

Whether Toffler is right or not, however, there is a strong possibility that, in the future, many will be unable to obtain employment, primarily as a result of the computer/communications revolution, and all will have more free time than is presently the case. The use and abuse of leisure could become society's chief preoccupation by the year 2000.

People who have spent a large part of their existence in the expectation that they must work to provide food, clothing and shelter, may have difficulty adapting to a situation in which their activities are no longer dictated or organised by the needs of employment. This is seen in the difficulties experienced by retirees. Laplante has commented that the golden age remains the age of boredom and solitude, for the vast majority of people.[123]

The risks involved in reducing work responsibilities are that increased leisure will lead to increased boredom, decadence, delinquency and alcoholism. The risks are increased by the fact that the current system of education provides few opportunities to learn to use free time to advantage.

The hope to be derived from a situation in which the majority find themselves without work responsibilities, is that there will be a flowering of creativity. In Victorian England, where for the first time in history, there was an educated, wealthy class that did not have to work hard, there were more creative people than at any previous time in the country's history. The age produced Darwin, Gilbert and Sullivan, Thackeray and many others.[124] Toffler suggests a return to a kind of sophisticated "cottage industry," in which present interests in hobbies, home crafts and handyman projects become dominant, community activities.[125]

Leisure according to the dictionary is "time free from employment..."[126] Aristotle said that leisure is the state of being free, not just from work or compulsion, but the state of being free to .... The essentials of Aristotle's concept are the opposition of

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[123] Marc La Plante, "Leisure in Canada by 1980," Canada: Department of National Health and Welfare, Fitness and Amateur Sports Directorate, *Leisure in Canada*. Proceedings of the Montmorency Conference on Leisure, Montmorency, Quebec, September, 2 - 6, 1969 (Ottawa, 1969), p. 21.
[124] Martin, op. cit., p. 173.
[125] Alvin Toffler, *The Third Wave*(New York: Morrow, 1980), p. 294.
[126] *Chambers' Twentieth Century Dictionary*, ed. by William Geddie, rev. ed. (Edinburgh: W.R. Chambers, Ltd., 1961), p. 609.

freedom and necessity. The idea of labour is not excluded, rather exclusion of the obligation or necessity to labour is the precondition of leisure.[127] Dumazedier has said that leisure is only that if it results from free choice, has no financial, useful or ideological end and meets the needs of the individual.[128]

Much has been written about human needs. According to Maslow's theory, which suggests an heirarchy of needs, lower level needs must be satisfied before attention can be given to higher needs. The five groups of needs isolated by Maslow are: physiological needs, safety needs, needs for belongingness and love, esteem needs and the need for self-actualisation.[129] If the essence of leisure is being free to express oneself through activity, be it intellectual, spiritual or physical, in order to strive toward one's full potential as a human being, then leisure can provide an individual with the means of self actualisation. This fact may provide the rationale for a new leisure ethic.

Society has gradually moved from prohibition of leisure toward its encouragement and we are, today, witnessing unprecedented government spending on cultural activities. In 1976, the Federal Government of Canada spent almost two billion dollars in the cultural area.[130] Such spending is dedicated, not only to the preservation of the arts and culture, but to the need to provide a means whereby the public can make profitable use of its leisure time, in ways that are supportive of Canadian nationalism.

Governments tend to be concerned with cultural and recreational, rather than leisure policies, because leisure is not seen as an unifying factor which can be funded for the benefit of all. The provision of cultural grants is also a more easily defended budgetary item. In Canada's case, it can be defined as a necessity because of the considerable risks of cultural domination, not only by the Americans but also, by the British and French.[131]

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[127] Farina, John, "Toward a Philosophy of Leisure," Canada. Department of National Health and Welfare, Fitness and Amateur Sports Directorate, *Leisure in Canada*, Proceedings of the Montmorency Conference on Leisure, Montmorency, Quebec, September, 2 - 6, 1969 (Ottawa, 1969) p. 5.
[128] Joffre Dumazedier, *Toward a Society of Leisure*, trans. from the French by Stewart E. McClure (New York: Free Press, 1967), p. 234.
[129] A.H. Maslow, *Motivation and Personality* (New York: Harper and Row, 1954), p. 39 - 46.
[130] Canada. Statistics Canada, *Canada Year Book 1978 - 79: an Annual Review of Economic Social and Political Developments in Canada* (Ottawa: Supply and Services, 1978), p. 817.
[131] Canada. Statistics Canada, *Perspectives Canada III*, ed by H.J. Adler, and D.A. Brusegard (1980), p. 132.

Cultural, entertainment and leisure time activities are increasing and diversifying, as demand increases. Three trends can be identified in the technological responses to the public's increased, leisure time. There is immense growth of entertainment facilities, world wide, with the involvement of practically all media. There are numerous technological inventions that permit independent communications use, for example, sound and video tape recorders and cameras. Lastly, there is the growth of a vast, entertainment industry which encourages widespread dissemination of cultural and artistic achievements and performances, provides facilities for entertainment, and mass produces, cultural products.[132]

Several factors affect choice of leisure activity. They include the environment, and the physical predisposition and personality of the individual. The environment may be considered as a factor which affects the population as a whole. Characteristics which will affect leisure activities include: climate, the size of the country, the state of the economy and the degree of technological innovation.

The harsh winter climate, particularly of the Prairie Provinces, tends to limit physical activity for a large percentage of the population. Even those involved in such sports as skating and skiing are confined to indoor activities when not actually participating in them. Thus, interest in indoor activities may be expected to be greatest in winter.

Canada's vast distances also affect leisure activity. Driving to places within a hundred miles of a city for the enjoyment both of the ride and the activities to be undertaken on arrival (camping, barbecueing, swimming, boating, etc.) is a popular pastime. Although there is currently a glut on the world's oil markets, it is expected that oil prices will continue to rise, so that continuation of this form of activity is uncertain. However, in spite of energy cost increases in the United States, there has, apparently, been no appreciable reduction in activities of this nature.[133]

Seventy percent of Canada's population resides in the cities.[134] This also affects leisure use. Facilities exist in urban areas for diverse leisure activities which rural areas

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[132] *Many Voices, One World: Communication and Society Today and Tomorrow* (Paris: UNESCO, 1980), p. 75.
[133] James E. Murphy, *Concepts of Leisure*, 2d ed. (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1981), p. 5.
[134] La Plante, op. cit., p. 29.

lack. A large population base is needed to justify costs of such facilities as art galleries, major shopping centres, live theatre, etc.

The affluence of Canada's population also affects its use of leisure time. Sports and leisure equipment manufacturers, commercial entertainment companies and even producers of major luxury items, such as boats and recreational vehicles, can find a market here. Vast choice is available to those who can afford it. Affluence has also allowed the Canadian population to take advantage of technological advances. Not only do most homeowners own various labour saving devices, they also own many leisure devices, i.e. stereophonic sound equipment, coloured television receivers, tape and/or cassette recorders and usually, several radio receivers.

Statistics suggest that Canadians watch 23 hours of television per week but read for only seven hours per week.[135] Therefore, as new technology becomes available, it is likely to be well received. Video games have become a craze. Many already own videotape recorders and the videodisc and the microcomputer can be expected to impact the market within the next few years.

As can be seen, several factors combine to incline Canadians to more sedentary activities than their counterparts in other Western countries, but the most forceful of these is the severity of the winter climate, combined with the society's affluence. One physical predisposition, which is applicable to the country as a whole, accentuates this trend. Canada's population is aging, so that a reduction in such physical activities as participation in sports can be expected, together with an increase in interest in spectator sports and other sedentary entertainments. Television watching, reading, home crafts and hobbies are likely to increase in appeal.

Under these circumstances, libraries should expect increasing demands on their facilities but such assumptions cannot be casually made. Numerous new entertainment and leisure activities are now able to compete with libraries, for their once assured readership. Pressure will increase on public libraries to move into the electronic age and to provide, not only leisure reading as they presently do, but other leisure oriented materials such as videotapes and videodiscs, which are in harmony with the new era.

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[135] Canada. Statistics Canada, *Perspectives Canada III*, ed by H.J. Adler and D.A. Brusegard (1980), p. 137.

E. Continuing and Adult Education

As the technological revolution moves forward and leisure time increases, the present demand for more intellectual activities and greater diversity of learning opportunities, can also be expected to increase.

Those in the work force will continue to require professional upgrading as well as general interest courses, seminars and study guidance. Those no longer involved in the work force, or only peripherally so, are also likely to look to education as they develop new interests and hobbies or seek new values and philosophies, to replace the work ethic.

For more than a decade now, there has been discussion of the concept of life long learning, as the need for a learning society has become increasingly clear. The basic pattern of current, educational practice which encourages students to complete three to four years of post-secondary education in their early twenties, and further encourages them to assume that upon completion they will be 'educated' and ready to begin 'real' life, is anachronistic. Education can no longer be limited to the young. A system which provides higher education, only at the prevocational stage of life, is inappropriate to an age which requires accelerating scientific discovery and more widespread technological application of the latter.[136] Reorientation, with regard to science and technology, has led to parallel needs in the social sciences and humanities. When change is the only constant and so much is possible, there is a need to develop new values.[137]

Thus, present demands for more educational opportunities are well founded. In 1974, Gould noted that studies showed that a third of American adults, between the ages of 18 and 60, and not involved in full time education, had taken courses, seminars, correspondence courses or private lessons, within the previous twelve months.[138] Tough has drawn attention to the increasing incidence of independent learning. He estimates that

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[136] Richard Gross, *Future Directions for Open Learning: a Report Based on an Invitational Conference on Open Learning Programs* (Washington: U. S. Government Printing Office, 1979), p. 3.
[137] Walter James, "The Open University: a New Phenomenon," *Mass Media and Adult Education*, ed. by John A. Niemi (Englewood Cliffs, N.J.: Educational Technology Publications, 1971), p. 97.
[138] Samuel B. Gould, "Open Learning – an Old Concept with New Perspectives." *Conference Proceedings: the First Annual National Conference on Open Learning in Higher Education.* Lincoln, Nebraska, 16 – 18 January, 1974, comp. by C. Edward Cavert (Lincoln, Nebraska: State University of Nebraska, 1974), p. 17.

70% of all adult learning projects, in Canada, are planned by the learner himself.[139]

The Faculty of Extension, at the University of Alberta, can also substantiate this trend toward increasing demands for continuing education. Enrolment figures for 1979 were 24,694; for 1981, they were 35,094, an increase of almost 42% in two years.[140] The demand for continuing educational opportunities exists but traditional delivery systems are rigid, often inconvenient and expensive. There is a need for greater flexibility.

When this trend first became apparent, interest of some adult educators veered toward the mass media as a possible solution to the flexibility problem. Television and newspapers were seen to have large and unused capacity to reach almost all adults, in their normal, daily lives. They were, and still are, particularly adaptable to the goals of life long learning, and adult educators realised that, without these facilities, their ability to offer service would be unnecessarily restricted.

Many educators became involved in the production of local and national telecourses, courses via newspaper and external degree programmes. The early 1970's witnessed the development of the open university, first in Britain and later, in the United States, Israel, France and many other countries.[141] Nevertheless, success has been somewhat limited. One way communication is deaf and blind and, although efforts were made to integrate correspondence education practices and face to face situation techniques, into televised courses, opinion polls consistently placed telecourses in the lower range of preferred learning opportunity choices.[142]

Within the last few years, however, a major change has taken place. Two way communication over distance, at reasonable cost, has become possible and this is allowing far more complete instruction to take place. This vastly increases the potential for distance education.

The term 'open learning' has been applied to this form of continuing education. Life long learning implies the availability of post-secondary education to all people,

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[139] A. Tough, *The Adult's Learning Projects* 2d ed. (Toronto: Ontario Institute for Studies in Education, 1979), p. 1.
[140] University of Alberta, Faculty of Extension, *Annual Report 1980 - 1981: Activities of the Faculty of Extension at the University of Alberta for the Year Ending March 31, 1981* (Edmonton: 1981), p. 21.
[141] Gould, op. cit., p. 17.
[142] Gross, op. cit., p. 6.

regardless of age, mobility or financial standing. Gould has defined open learning as, "a process characterised by unusually flexible possibilities for each person as he considers individual limitations of time, location, financial circumstance, ways to learn, rewards and the subject itself."[143]

Open learning, facilitated by the new technological innovations, provides a major advance toward the concept of the learning society but new technology also presents new problems. Educators, working in an unfamiliar medium, can no longer rely on procedures and methods that are trusted and familiar in a classroom situation but which assume unexpected limitations when used in conjunction with the new media. New learning systems must be capable of eliciting, interpreting and evaluating students' goals both at the entry point and throughout the students' contact with a programme.[144] Reward systems may not be appropriate to the new media and the need for awareness of the learners' environment may also present problems.[145]

There are other problems. The market is unpredictable. A student requires considerable self-discipline to finish a course of televised lessons. There is no supporting institutional structure or peer group pressure, and there are countless, attractive alternatives to studying, so that early one way television courses were plagued by high dropout rates. Secondly, costs of producing television and video conferencing programmes are high. This is a major problem for educational institutions because they have limited budgets, and yet North American audiences are used to sophisticated programming. However, video recording has the advantage that, although initial production is expensive, the material may reach a vast audience, either immediately or as a result of repeated showings.

Specific uses of computer and communications technology, in continuing education, include televised courses, various teleconferencing arrangements and computer assisted instruction and learning.

As noted, television has had varying success as a teaching medium. A televised lecture is cheap but dull. At the other extreme, *Cosmos* was a major commercial success

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[143] Gould, loc cit.
[144] Gross, op. cit., p. 3.
[145] Wm. G. Harley, "How Open is Open Learning?" *Conference Proceedings: the First Annual National Conference on Open Learning in Higher Education*, Lincoln, Neb., 16 - 18 January, 1974, comp. by C. Edward Calvert (Lincoln, Neb.: State University of Nebraska, 1974), p. 47.

which fascinated millions of viewers but cost $10,000 per minute to produce.[146] At the same time, its teaching, lacking the reinforcement achieved by student involvement, may not have the lasting impact that would justify its costs.

The open universities use radio and television in conjunction with required reading and activity packages, sometimes including learning kits that may contain audio-cassettes or slides. These are sent to registered students by mail. Counselling and tutoring is usually available at existing local institutions such as schools and libraries. The programmes may be limited by lack of broadcast television channel capacity, as is the case in Britain, where this problem limits the number of programmes that can be made available and restricts these to certain hours. This should not present a problem in Canada, however, because of the existence of the cable network.

Commercial television networks are often less than enthusiastic about broadcasting educational programming, because of its limited, audience appeal. However, this problem may be overcome by the use of cable systems and learner use of videotape recorders could resolve the time problem. Qube, as previously noted, has a number of channels providing continuing education programmes which also allow two-way communication by means of a key pad. The programmes are apparently, well received.[147]

The technology has also produced a new phenomenon in education, 'the television don'. These teachers, gifted, knowledgeable and articulate, can now reach large audiences, their gifts no longer limited to the few who are lucky enough to be students at the institutions in which they work.

The form of instruction that is likely to have the greatest impact on distance education, however, is teleconferencing in all its manifestations. The University of Calgary has had considerable success using audio conferencing to run a credit course, in English literature, for rural students[148] and the University of Wisconsin-Extension has also used this method of delivery to advantage.[149] Alberta Access is now providing distance education via satellite, with telephone hook-up to facilitate two-way communication.[150]

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[146] Martin, op. cit., p. 188.
[147] Wicklein, op. cit., p. 19.
[148] Barry Ellis, "Teleconferencing at the University of Calgary," *Access Newsletter: Bandwidth*, No 3 (April, 1981), p. 33.
[149] Johansen, Vallee and Spangler, op. cit., p. 13.
[150] Ian James, "Twinkle, Twinkle Little Star," *Bandwidth*, No 5 (December, 1981), p. 68.

Alaska has similar facilities.[151]

Computer assisted learning is, presently, somewhat limited in its usefulness. It is ideally suited to drills and other forms of rote learning, can check on the validity of its own programming by checking students' performances and reactions, and it also allows the student to work at his own pace. It is of less use in theoretical, aesthetic and cultural activities. However, a great deal of research is presently being done on improved use of the computer as a learning and teaching tool. One of the most promising of these studies is the LOGO programme, developed at MIT. This is intended to facilitate discovery learning and reverses the usual, computer assisted, instruction procedure in that it allows the student to 'teach' (or programme) the computer.[152]

PLATO is another version of computer assisted instruction (CAI). It shares the advantages of other CAI systems and there are many programmes available. However, the value of any system depends on the quality of the programme being used. It is likely that CAI will reach its full potential only when artificial intelligence studies have achieved a natural language interface between student and machine, and common sense reasoning by the computer.

Other means whereby technology is interacting with education include videotape recorders and laser videodisc players. The latter, whilst only recently available in Canada, offer promise of becoming a major tool for distance educators, which will be particularly valuable in teaching rural students, as well as those located in hospitals, jails, old age homes, etc. Videodiscs will offer a new form of instruction, as well as the ability to carry very large stores of information for the student's reference. For example, McGraw-Hill's pilot, high-school/ college level, biology course uses a videodisc. This contains 26.5 minutes of sound and motion picture sequences, 2.5 minutes of introductory material and 40 seconds of start up instruction. This leaves 20 seconds of disc time for textual material which is enough space to accommodate a fairly large textbook.[153]

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[151] "Learn Alaska: Instructional Telecommunication Network," *Bandwidth*, No 5 (December, 1981), p. 77.
[152] Seymour Papeart, "Computers and Learning," *The Computer Age: a Twenty Year View*, ed by Michael Doutouzos and Joel Moses (Cambridge, Mass.: MIT Press, 1980), pp. 80 - 81.
[153] Norwood, op. cit., p. 165.

The existence of the new technology leads, inevitably, to the question of the availability of software. The methods of communication are available. The telephone can link computer terminals, or microcomputers, to sources of information. Coaxial cable and satellites can facilitate two-way communication between student and educational instititution but they will remain under-utilised as long as software is limited. Consequently, the next decade is likely to witness incredible demands for high quality, educational programming, in all media areas.

There can be no doubt of the impact of the public media, particularly television, as a means of access to knowledge and culture. At one time, access to cultural creations was limited to book shops, libraries, museums and art galleries, theatres and concert halls. Today, cultural recordings often reach audiences of many millions. (It is estimated that the television production of *The Forsyte Saga*, reached 57 countries.)[154]

An increase in the educational potential of the communications media is evident, but decentralisation of learning has meant that the educational establishment has lost its monopoly. The mass media and private enterprise are both competing with formal educational institutions for the student's interest and dollars.

Although a variety of modes of education is potentially valuable in a democratic society, the application of commercial values to education must provide some cause for concern. Until recently, the school was the primary source of knowledge. The education it offered was founded on values of order, effort, concentration and competition. Knowledge, presented by the media, is a mosaic. It no longer corresponds to the traditional, intellectual categories. The public media, unlike formal education systems, focus on all that is novel, topical and new and bombards citizens with an ever increasing volume of information. As a consequence, the majority is left with a brief overview of events, often sensationalised. A world in turmoil is presented in a way that suggests easy understandings and simplistic answers to complex problems. Such an education provides no foundation on which to build principles, values, opinions or a system of philosophy.

Potentially, the individual has access to more information than ever before but man's ability to process information is limited. There is a limit to the number of stimuli that the human brain can absorb at one time. This leads to the suggestion that supplying

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[154] *Many Voices, One World: Communication and Society Today and Tomorrow*, (Paris: UNESCO, 1980), p. 98.

information to the individual is less related to speed than to 'recoding' or 'packaging'.[155] Educators and librarians are best qualified for that task.

Thus, the educational establishment is challenged. Just as the industrial revolution devalued routine, manual work, the information revolution has devalued routine, mental work. The citizenry is no longer satisfied with bare facts. It needs the ability to locate and manipulate them. The new values involve not only knowledge but the ability to differentiate between fact and opinion, between truth and propaganda, and the ability to synthesise and analyse the information received.

If automation reduces the opportunity for employment, as seems probable, the need for education to provide, at least, some direction in the responsible use of leisure, and some guidance toward basic philosophical values, will be great. But formal education will not be allowed to work in isolation. It will make use of the new communications systems and alternate between co-operation and competition with the mass media.

By the same token, it is likely that equally great demands will be made on libraries. They will be required to provide the information needed to support the educational establishment, to provide substance to material covered in the mass media's mosaic, and to provide their share of leisure time enjoyment, in the format needed.

Notes on Chapter 7.

Sources of information that were of particular importance in this chapter were:

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[155] G. Miller, *Psychology of Communication* (New York: Basic Books, 1967), p. 41.

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Murphy, James E. *Concepts of Leisure*. 2d ed. Englewood Cliffs, N.J.: Prentice-Hall, 1981.

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VIII. Effects of the New Technologies on Libraries

A. Introduction

The influences of the new technologies on libraries cannot be listed in a simple, straight-forward fashion. They are complex and their effects are not yet fully realised. The new technologies have, in fact, affected libraries in many and profound ways and yet, it seems that the real revolution in communication is just beginning. During the last twenty years, telecommunications improvements and the advent of the computer have encouraged the larger libraries to begin the process of automation and to use distant data banks, on a routine basis. The smaller libraries have been left to assume that such activities are beyond both their means and their needs. But improvements in technology are continuing and libraries, both large and small, will feel the effects of this revolution. Western civilisation is moving steadily toward electronic information storage, leisure time is increasing and competition for the patron's time and attention is becoming fiercer.

B. The Challenge

As has been shown, changes in communications technologies do not happen by chance. They are provoked by human needs. Printing grew out of the work overload in the monasteries, the specialisations that had developed there, and consumer demand. Electronic information storage is a direct response to the overwhelming nature of the information explosion.

> At the rate at which knowledge is growing, by the time the child born today graduates from college, the amount of knowledge in the world will be four times as great. By the time the same child is 50 years old, it will by 32 times as great and 97 per cent of everything known in the world will have been learned since the time he was born.[156]

Even if such prophecies are wildly exaggerated, there is no question that the knowledge explosion will continue. To attempt to organise, store and disseminate the information generated, by the methods presently used in most libraries, would be ludicrous. Libraries must take advantage of the new electronic storage and retrieval systems and must adapt to the new realities. It has been said that the challenge of automation is a challenge for education because the latter must provide an environment in

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[156] *Bandwidth*, No 4 (August, 1981), p. 45.

which the individual may discover and develop himself.[157] Because libraries have similar objectives, they must also accept the challenge. On a practical level, automation might be viewed as a life-line. The need for access to information will increase, even as the quantity of information being produced reduces the ability of paper based methods of storage and retrieval to provide it.

Libraries have long been society's chief sources of information. They have the advantages of being free (if tax contributions are ignored), they are usually located within easy reach of their clientele and they usually provide professional assistance in locating information, which they possess or can acquire, in digestible and manageable form. They also bask in the sunshine of the commonly accepted belief that their existence is necessary to the survival of democracy, as providers of free access to information.

In spite of this superficial optimism, libraries are showing signs of cracking under the strain of trying to provide a viable service under increasingly difficult conditions. A partial answer to the information explosion has been the development of various library networks, based on telex or telephone communication but the majority have proved to be less than satisfactory. Inter-library loan requests may take several days or several weeks, to reach the requesting patron, through no fault of the libraries involved but as a result of slow communications and an overwhelming number of requests.

Libraries make great efforts in the public relations arena. They are constantly anxious to assure their financial backers that the service they are providing is valuable. And it is. Yet only 44% of the population made even a single visit to a library, in 1977.[158] If grade school students had access to adequate school libraries or sources of information at home, the number would be considerably less.[159] Even for those who use them, libraries are not the chief source of books.[160] A matter of even greater concern is that, according to Statistics Canada, the average Canadian spends only 23 minutes per day

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[157] John C. Macdonald, "Automation and the Changing Nature of Work," *Coming of Age: Canadian Adult Education in the 1960's*, ed by J.R. Kidd and G. Selman, (Toronto: Canadian Association for Adult Education, 1978), p. 36.
[158] Canada. Statistics Canada, *Perspectives Canada III*, ed by H.J. Adler and D.A. Brusegard (Ottawa: Supply and Services, 1980), p. 136.
[159] *Project Progress: a Study of Canadian Public Libraries*, (Ottawa: Canadian Library Association, 1981), p. 85.
[160] "Libraries Can Grow as Book Source," *Feliciter*, Vol 27, No 5 (May, 1981), p. 1.

reading books.[161]

Academic libraries are less concerned with public relations but they are often bewildering to their clientele: access to information is dependent not only on an understanding of the intricacies of the catalogue but also on the use of periodical indexes and abstracts and on awareness of the existence of various other sources of information. These difficulties are often compounded by the size of the collection and by its dispersed location in several buildings.

Inflation, in both labour and materials costs, is gradually strangling all libraries. Book prices are inflating at the rate of 14.5% per annum.[162] The average price of a scholarly journal in the U.S. between 1967 and 1969 was $8.66. By 1980, the cost had risen to $34.54.[163] The secondary sources are fast becoming too expensive for any but the largest libraries to acquire. In 1940, the price of *Chemical Abstracts* was $12 per annum. In 1982, it is $5200.

Libraries' budgets have not kept pace with this soaring inflation. Salaries have been forced, by unions and market conditions, to keep pace with those in other, similar employment areas and as a consequence of the labour intensive nature of library activities, 70% of most libraries' operating budgets are spent on salaries and benefits.[164]

In his article, "Whither Libraries? or Wither Libraries",[165] Lancaster states that the number of scientific journals being published, at time of writing, was approximately 5000 and that this number was expected to increase by 2 - 4% per annum.

Libraries are not the only institutions having difficulty accommodating this deluge of material. Publishers must often refuse papers that should be published. Consequently, there may be long delays between acceptance and publication of a paper, so that in the case of science, research results often do not reach the public domain until long after they should have been available. In 1974, *The Journal of Sociometry* received 550

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[161] Canada. Statistics Canada, *Perspectives Canada III*, ed by H.J. Adler and D.A. Brusegard (Ottawa: Supply and Services, 1980), p. 136.
[162] *Bowker Annual of Library and Book Trade Information*, 26th ed. (New York: R.R. Bowker, 1981), p. 334.
[163] Ibid., p. 342.
[164] Joseph Lewis Wheeler and Hebert Goldhor, *Wheeler and Goldhor's Practical Administration of Public Libraries*, rev. ed. by Carlton C. Rochell (New York: Harper and Row, 1981), p. 121.
[165] F. W. Lancaster, "Whither Libraries? or Wither Libraries," *College and Research Libraries*, Vol 39, No 5 (September, 1978), p. 346.

papers and published 39.[166] Even allowing for the fact that some may have been of inferior quality or repetitious of others, it is unlikely that every important article found its way into print. It is not surprising that the scientific community has long been anxious to develop the electronic journal.[167]

From the librarian's point of view, a great deal of information has been lost to him. The publishers have failed to print all that should be available and the library has failed to acquire all that is available. Although it has been recognised, for many years now, that libraries can no longer claim to be the reservoirs of the world's knowledge, such gaps undermine their viability. Obviously, no library can possibly acquire all information in the public domain. Storage facilities, library budgets and sheer accessibility, all militate against this but a means of access to information is needed which would eliminate the gap between what is possible and what is needed.

C. Adaptation to the Electronic Age

If they are to survive, libraries must a) find a means of providing information efficiently and cheaply and b) must reduce their dependence on manual labour. The communications revolution holds the promise that both these conditions can be met.

The large libraries, both public and academic, have begun the process of adaptation to the electronic age. By acquiring appropriate computer terminals and making the necessary administrative and financial arrangements, they have acquired access to bibliographic utilities and citation and information data banks. A variety of computer based, stand alone systems have also been installed.

By using Canada's major bibliographic utility, UTLAS, many of the larger libraries have been able to close their card catalogues, reduce the time needed to catalogue materials purchased and produce catalogue entries of a uniform standard. Eventually, they will achieve fully automated, retrospectively converted catalogues. This will allow major efficiencies from the viewpoint of both the public and the library. For example, an automated catalogue can be adapted for use in a circulation system, it can accelerate the location of materials for inter-library loan and other purposes and can, eventually, be

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[166] R. C. Roistacher, "The Virtual Journal," *Computer Networks*, Vol 3, No. 2. (1978), p. 20.
[167] George Chacko, "Toward an Integrated Electronic Communication System," *Journal of Research Communication Studies*, Vol 1, No 4 (October, 1979), p. 273.

made into a public file. The latter could become a node in a network, accessible from a distance, by libraries or individual users. Guelph University Library has an automated catalogue and has provided computer terminals for patron use, both in the public areas of the library and throughout the the University campus.[168]

The majority of small and medium size libraries are unlikely to follow the lead of the major libraries in this respect, for some time. Use of UTLAS is expensive because communications costs are high and, at present, needs do not warrant such expenditures.

A further improvement in efficiency, for the larger libraries, has been the ability to search citation data bases on-line. As noted, in many cases it is possible to obtain hard copies of the full text of the material retrieved, either directly or by mail. In others, the user may face the frustration of knowing that a particular article exists but that his library does not subscribe to that journal. The efficiency of the search is soon lost in the slow pace at which, by comparison, inter-library loan requests can be received.

Use of these data banks can speed the search for information and should, eventually, eliminate the need to purchase periodical indexes. This should constitute a major saving, especially for academic and research libraries.

At present, computer searches are less frequent than might be expected, because of the costs involved, because printed indexes are still being purchased by libraries and because specialised knowledge is needed to conduct a search. However, Lancaster notes that newly opened, special libraries rarely subscribe to indexes but rely entirely on access to the data banks.[169] It is also notable that some academics are now by-passing the library and either conducting their own searches, or employing professional library consultants to do these searches for them, in the belief that time saved warrants the expense.[170]

Small and medium size libraries may provide limited search services, in the near future, by means of microcomputers. These are now cheap enough for small libraries to purchase, although acquisition may not be immediate. Library managers will need time to overcome their conservatism and to learn which machines are most appropriate to their

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[168] Ann Vanderhoof, "How Guelph Beats the System," *Quill and Quire*, Vol 47, No 4 (April, 1981), p. 5.
[169] F.W. Lancaster, and Herbert Goldhor, "The Impact of On-Line Services on Subscriptions to Printed Publications," *On-Line Review*, Vol 5, No 4 (August, 1980), p. 306.
[170] Drake, op. cit., p. 234.

needs.

Some public libraries have placed microcomputers in their public areas. The Medicine Hat Public Library conducted an experiment of this nature during 1980.[171] The majority of public libraries that have introduced microcomputers, however, appear to have done so as a public relations "gimmick," rather than with a view to making them an integral part of their service to the public. This view of the microcomputer, as a novel method of attracting new patronage, will change as its usefulness becomes apparent.

Many large libraries have acquired stand alone computer based programmes for various purposes. Many of these are turnkey systems such as CLSI's circulation package. This is minicomputer based and can be purchased complete with software and servicing contract.

DOBIS (Dortmunder Bibliothekssystem), also a stand alone system, is a library management programme that is under development at the National Library of Canada. It has been implemented, in part, by some other libraries. Ryerson has used the DOBIS/LIBIS circulation module and the University of Alberta plans a complete implementation of the same version of the system. Serials check-in and automated acquisition systems may also be developed at individual institutions using the parent organisation's computing facilities.

Most small and medium size libraries in Canada have not acquired stand alone systems because of the expense involved and the expertise needed. Automated circulation, acquisitions and serials check-in will occur in these libraries, once programmes become available that can be run on microcomputers. Blair[172] suggests that some programmes already exist and expects their early utilisation. However, Pratt's comment[173] that most small libraries presently lack sufficient expertise to acquire and use this equipment, probably still holds true.

Dowlin sees new roles for the library[174] arising out of present use and out of the new technological developments. He suggests that libraries could provide access to community conference and message centre programmes, could provide on-line access

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[171] Harvey Duff, "Micro's is Medicine Hat: First Steps in a New Field," *Access Newsletter: Bandwidth, No 3* (April, 1981), p.38.
[172] John C. Blair, jn., "Micros, Minis and Mainframes.... a Newcomer's Guide to the World of Computers - Especially Micros," *On-Line*, Vol 6, No 1 (January, 1982), p.14.
[173] D. Pratt, "The Use of Microcomputers in Libraries," *Journal of Library Automation*, Vol 13, No 1 (March, 1980), p. 17.
[174] Kenneth E. Dowlin, "The Electronic Eclectic Library," *Library Journal*, Vol 105, No 21 (1 November, 1980), p. 2265.

to the library's and other libraries' resources and access to terminals, for those who cannot afford their own.

Dowlin describes the uses made of the computer at Pikes Peak Library, as an indication of potential future library use. Pikes Peak has various community-oriented directories and other information, available to anyone who has a library card and access to a terminal or microcomputer. Currently, an attempt is being made to set up a computer conferencing facility. Dowlin also notes that the use of cable or videotex for reference service could become an ideal means of reaching non-traditional library users.

It can be expected that the trends that have evolved in the larger libraries will continue. Presumably, an automated circulation system or catalogue will lead naturally to the automation of other aspects of the library's services. Thus, an ideal state can be envisioned in which automation eliminates delays and frustration and allows more time for librarians to assist patrons in their searches for information.

At present, for most of the small and medium size libraries, both public and academic, automation of internal functions is still only a future possibility.

D. External Influences on Libraries

Future directions for all libraries are, however, not entirely dependent on their ability to automate various internal functions. Considerable discussion is to be found, in library literature, of several other influences. These include the demise of print and/or the arrival of paperless information systems, the influence of the new technologies, both as media of information and as an influence on the life-style of Western civilisation and potential competition from the private sector. All can be expected to exert an influence on libraries.

The Demise of Print

In 1945, Vannevar Bush described Memex, a paperless information system. It is the earliest account of what it would be like to have an enormous library of information at one's fingertips.[175] At the time, the possibility that print would ever cease to be the major medium of information storage was not seriously considered. Even today, the difficulties inherent in the organisation of electronically stored materials, the

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[175] Vannevar Bush, "As We May Think," *Atlantic Monthly*, Vol 176, No 1 (July, 1945), p. 101.

short-comings of the technology and rights of ownership of material published in electronic form, present formidable barriers to the development of such systems. However, the possibility of paperless information systems is now taken seriously. Computer memory capacities are increasing, communication systems are becoming faster and cheaper, and input and output methods are improving. As a result, and in response to an ever increasing need, electronic storage, transfer and retrieval of information has already begun.

Lancaster[176] and Cawkell[177] [178] have both written, at length, on the subject of paperless information systems but they are not alone. Although there is some disagreement concerning the speed at which paperless information systems might be achieved, many scholars believe that most periodicals, indexes and reference materials will be available, only in electronic form, by the year 2000. Some scholars also include books in their predictions, but the majority find this unlikely, except for reference materials. Reference materials are well suited to electronic storage because of the need for annual up-dating. By accessing encyclopedias, directories, dictionaries and mathematical tables from a central data base, the library could achieve great savings as well as remove considerable drudgery, from the shoulders of its staff. Otherwise, the book has numerous advantages. It contains massaged knowledge rather than isolated facts and scraps of information, so that its knowledge is in a manageable, digestible form. It is familiar, portable, convenient, encourages the use of good literary style and arouses warm feelings in the hearts of readers. To read a news item or a journal article from a CRT screen seems acceptable, in the interests of speed and efficiency, but to be offered the world's great literature by this means, would be incongruous.

Thus, the libraries' book collections are likely to survive as long as publishers continue to produce materials in book format. But this is a major condition. Godfrey[179] suggests that paperback books will continue to be printed but that hardcover editions may not. It may be that libraries will cease to maintain formal collections of fiction

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[176] F.W. Lancaster, *Toward Paperless Information Systems*, (New York: Academic Press, 1978).
[177] A.E. Cawkell, "The Paperless Revolution," *Wireless World*, Vol 84, No 1511 (July, 1978), p.38.
[178] A.E. Cawkell, "The Paperless Revolution - 2," *Wireless World*, Vol 84, No 1512, (August, 1978), p. 71.
[179] David Godfrey, "Survival of the Fastest," David Godfrey and Douglas Parkhill, eds., *Gutenberg Two* 2d. ed.(Vancouver: Press Porcepic, 1980), p. 119.

because of a lack of availability of hard cover editions. He also suggests that textbooks would be more appropriately provided in electronic form, in order to accommodate up-dating.[180] If this should occur, print collections could become purely archival and libraries would become virtual information systems.

Technological Innovations

Technological innovations that are likely to have the greatest impact on libraries include videotex, the microcomputer and the videodisc, in combination with various improvements in the communications media, as previously noted.

Videotex

Videotex, a two-way communication system which allows a television receiver to behave as a computer terminal, will eventually allow patrons to access information data bases, such as those provided by DIALOG and The Source and, if it is prepared for them, the local library's data bases, too. Remote access to a library's catalogue immediately implies a means of document delivery. Although it is expected that transmission of periodical articles and reference materials will be possible electronically, eventually, books will present a more challenging problem. Local delivery involving the national mail system would negate the speed and efficiency of the original transaction. Courier services may provide a solution, if expenses can be minimised.

Wicklein states that a proto-type home printer has been developed that would be capable of reproducing the contents of a book at great speed.[181] However, such a method of delivery is unlikely to have wide appeal. It should also be noted that remote access, involving receipt of hard copies on a home printer, assumes resolution of the copyright problem.

Microcomputers

The microcomputer is likely to have considerable influence on all libraries, whether as a result of library use or of private ownership. The microprocessor is already invading every aspect of the North American lifestyle. Electronic toys and games and microcomputers in schools are breeding familiarity, among the young, with the erstwhile wonders of electronic gadgetry. Semi-conductor chips will soon be incorporated into

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[180] Alan Twigg, "Dave Godfrey: I'm Quite Hopeful About the Demise of Some Areas of Publishing," *Quill and Quire*, Vol 47, No 4 (April, 1981), p. 16.
[181] Wicklein, op. cit., p. 65.

most household appliances and are already being used to fine-tune automobiles.

It seems a small step, from this point, to the acquisition of small home computers which can communicate with the world outside.[182] Although it is probable that only upper and middle income families will acquire microcomputers in the near future, it is noteworthy that the majority of library patrons also derive from this socio-economic group.[183] As an investment in a child's education, as a convenience for the business or professional person who needs to bring work home or as a means of earning from part-time work, it could become an attractive investment. Its ability to retrieve information is an added advantage. In fact, an American Congressman has suggested a tax concession to purchasers of microcomputers, as a means of encouraging their use.[184]

Turoff suggests that microcomputers will be used in the home, at first, as word-processors, and that their versatility will be discovered as new needs develop.[185] If this occurs, and predictions are that it will,[186] many library patrons will have a means of communicating with remote data bases, from their homes. Even those dependent on videotex terminals will not be limited in their ability to retrieve information for long. Gateways which will allow users to access a foreign host are already under development. In fact, Infomart's *Grassroots* is planning introduction of this facility.[187]

At present, accessing a citation data base is restricted, for the layman, by the psychological barriers of cost and ignorance not only, of the technology but also of the materials available. However, these barriers are not insurmountable. The situation may change when the protocols, needed to access the data bases, have been simplified and searches can be made from the warmth and comfort of home. This will occur when Telidon or two-way cable television becomes available or when microcomputers achieve wide distribution in private homes. It will receive a further boost when iNET becomes a reality.

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[182] M. Turoff, and T. Featheringham, "Libraries and Communications Technology," *Catholic Library World*, Vol 50, No 9 (April 1979), pp. 368 - 373.
[183] *Project Progress: a Study of Canadian Public Libraries* (Ottawa: Canadian Library Association, 1981), p. 90.
[184] "A Tax Credit for Home Computers," *Bulletin for the American Society for Information Science*, Vol 8, No 3 (February, 1982), p.12.
[185] Turoff and Featheringham, op. cit., p. 370.
[186] Jonathan Chevreau and Andrew Toller, "Industry Views Long Term With Optimism," *Globe and Mail: Report on Computers* (29 March, 1982), p. R1.
[187] Lilly Trabucco, "Teleshopping: Will Your Television Set Become a New Department Store?" *Bulletin of the American Society for Information Science*, Vol 8, No 3 (February, 1982), p. 16.

Videodiscs

The laser videodisc could, as has been noted, provide a means of computer storage of educational material, entertainment or textual information. Consequently, libraries are unlikely to remain so strongly print oriented in the future, because the videodisc will provide a second format for massaged knowledge. Because of the videodisc's great storage capacity, it is extremely versatile. It can be used purely as an entertainment package, offering for example, films, recorded sports events or music. It is ideal as an educational medium, being able to provide video, stereophonic sound, two tracks for dialogue, still pictures, diagrams and text. In both of these capacities, it could be acquired by libraries for circulation to patrons.

The videodisc's ability to store text, however, may make it particularly useful as a library tool. Working in conjunction with a microcomputer, it could be used for data storage. Such a facility could be used for random access to periodicals which could be stored in full text format. This would allow even small libraries to become major information centres. Patrons might access such a data base in the library or from home, and costs would be minimal.

The Private Sector

Competition from the private sector and continuing, straitened, financial circumstances may also cause changes in the future development of libraries. The necessity to compete will engender a market oriented approach to library services. It may force the termination of some of these and new approaches to others. It will also provide a spur to the provision of new services, such as microcomputers, programmes and instruction in their use, to those who cannot afford their own equipment, as envisioned by Dowlin.

E. Projected Changes

As can be seen, both public and research libraries of the future are likely to be different from the present institutions. There will be a much greater dependence on technology, research services will be expected, many patrons may never actually enter the library and delivery services are likely to be required.

Research libraries will probably be more immediately affected than public libraries by the advent of paperless information systems. COM catalogues are in general use among larger libraries but are encountering some user resistance. Guelph has already demonstrated the value of publicly accessible terminals for searching circulation information. Presumably, the next step is to provide a means whereby students could do their own computer searches. The need for this facility is likely to become more urgent when indexes cease to be viable purchases. Such searches could be greatly simplified if research libraries had their own videodisc based periodical storage.

Some scholars have predicted the demise of libraries as a result of the fact that their patrons will no longer be dependent on them for information. Lancaster has raised the question of the role of libraries in an electronic age,[188] and it has been noted that scientists are already by-passing libraries because they are not sufficiently current. It seems more likely, however, that the library will change its function. Public libraries may become more community centered. They may provide a centre for special interest groups and activities or entertainment, and information via microcomputers for those lacking their own equipment. They will probably continue to circulate print and non-print materials.

Academic libraries may find greater demands being made on them for research assistance, their professional staff being required to provide specialised services that are presently impractical because of time constraints.

The role of the library staff is likely to be strongly affected by the influence of the new technologies on libraries. Reduction of the clerical and manual work load should reduce the need for non-professional staff and increase the need for professional services. So great a dependence on technology will increase the need for human mediation between the computer and the patron. Librarians of the future will need to be learned, humanistically-oriented and technically competent.[189] They may be required not only to find materials, but to place them in usable formats and to do additional necessary research. They will thus fulfill the role of elucidator, synthesiser and information broker.

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[188] F.W. Lancaster, *Toward Paperless Information Systems* (New York: Academic Press, 1978), p.156 - 159.
[189] Manfred Kochen, "Technology and Communication in the Future," *Journal of the American Society for Information Science*, Vol 32, No 2 (March, 1981), p. 156.

F. Technological Influences on the Books By Mail Library

For the books by mail (BBM) library, the new technologies will provide new challenges and vastly increased opportunities for service. The technology will essentially eliminate the present differences between BBM and other libraries. It will make it possible for a books by mail library to offer services which it was previously unable to perform and will force other libraries to become involved in actual document delivery.

This hypothesis rests on a number of suppositions. It is assumed that the general public will, eventually, have access to some form of videotex service or a computer terminal, which will allow direct communication between a library's data base and its clientele. It is assumed that the promise of the videodisc as a text storage medium will be fulfilled and it is assumed that the microcomputer will eventually, come into general use.

The advent of videotex services would place pressure on books by mail libraries to make their catalogues available for patron's direct use and to provide a simply operated, subject searching facility.

The acquisition and use of videodiscs, as local storage media, would allow a books by mail library to inaugurate several new services. Normally, such libraries do not stock periodicals because of the difficulty of circulation by mail. Reference materials, such as encyclopedias and handbooks, present similar problems so that reference collections are normally, minimal. However, videodisc storage of periodicals and reference materials, accessible by microcomputer with hard copies of specific items produceable on demand, on a nearby printer, would vastly increase a library's usefulness to its patrons. Reference services would be made faster and more efficient, with less effort on the part of the library staff.

Books by mail libraries will be forced to compete in the market place for patrons, just as other libraries will. Consequently, administrators will need to formulate more aggressive market oriented strategies and initiate new services. Like other libraries, they must also expect to provide more professional information services than is presently the case.

G. Conclusion

Once it is accepted that technology will eventually provide information efficiently, cheaply and conveniently, a series of concerns becomes apparent, for all libraries and their employees. These include the time available to prepare for change and the future role of the library profession.

It is not possible to assess accurately, the time needed for the implementation of electronic information systems, but the speed with which technological developments are occurring, makes it imperative that librarians prepare now, for the coming changes. To date, the profession has reacted only slowly to the technological revolution. In fact, De Gennaro has suggested that librarians may not have grasped the extent to which technology is changing their world.[190] Several factors have contributed to the library profession's inclination to ignore technological developments. These include recognition of the facts that: political decisions are always slow, achieving uniform standards is extremely difficult and communities tend to be inert. Reliance on the enduring quality of these difficulties, however, risks leaving the profession and its institutions, unprepared for the future.

Although negative responses are normal among people faced with changes that they do not understand, a more positive outlook might be expected among librarians, who should welcome the new developments. The new technologies hold out the promise of relief from old-fashioned, inefficient and costly methods of providing service and offer new opportunities for a more sophisticated and effective approach to the organisation, storage, retrieval and dissemination of information.

Mary Berger coolly accepts the fact that most information will be stored electronically, eventually. She advises librarians and other information specialists against attempts to cling to old methods but encourages them to rise to the challenge of the new information age[191] which, while it may reduce the importance of the library as an institution, holds out the promise of improved status for the library profession.

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[190] Richard De Gennaro, "The Information Age Revolution," *Publisher's Weekly*, Vol 216, No 21 (26 November, 1979), p. 27.
[191] Mary C. Berger, "The Endangered Species? Can Information Service Survive?" *Bulletin of the American Society for Information Science*, Vol 8, No 1 (October, 1981), pp.12 - 14.

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The following materials were particularly useful in preparing this chapter.

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IX. Possible Responses of the Books By Mail Library to the Computer/Communications Revolution

A. The Early Books By Mail (BBM) Library Services

Most of Canada's older books by mail libraries have been in operation for several decades. They were originally established as temporary expedients, to provide library services until such time as normally accessible public libraries could be established. Most began their services by lending book boxes containing thirty or forty books, to isolated communities, for periods of three to four months. When it became apparent that a more personal service was required, many began a family or "open shelf" service.

In some provinces, the universities, such as those of Manitoba and Alberta, offered library services by mail to rural residents, as a public service. Now, all except McGill and Alberta have withdrawn in favour of Provincial library agencies. New Brunswick's service was established in 1934[192] by the Legislature Library and is now operated by the Province. British Columbia's service, established in 1923, is now being phased out by the British Columbia Library Services Branch, in favour of smaller, regionally operated, mailing services.[193] Others ceased operation as the establishment of new public libraries made them redundant. Today, the Manitoba Public Library Services Branch continues to provide books by mail but this is a very minor aspect of its service. Greater importance is attached to the circulation of boxes of books to small rural libraries, in an effort to encourage their growth and development. The Saskatchewan Provincial Library Service is continuing its books by mail service to the northern areas.[194] It is intended to phase this service out as soon as northern regional library systems can be developed. There are no mailing services in Nova Scotia or Prince Edward Island.

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[192] Choong H. Kim, *Books By Mail: a Handbook For Libraries* (Westport, Conn.: Greenwood Press, 1977), p. 384.
[193] Ibid., p. 383.
[194] Saskatchewan Provincial Library. *Annual Report 1979,* (Regina: Provincial Library, 1979), p. 12.

B. The New BBM Library Services

In the late 1960's and early 1970's, a new phenomenon developed in the United States and was soon copied in Canada. Perhaps, partly as a result of the influence of Jordan's book, *Tomorrow's Library*[195] but also, out of a need to reduce library costs, the idea developed that a mailing service might allow a library to provide an efficient, effective and economical service to rural areas. It was soon realised that, when such a service was developed as part of an existing library, it could also be used to serve the elderly, the handicapped and the institution bound, in urban, as well as rural areas and could, thereby, supplement or replace volunteer based shut-in services. In some cases, bookmobiles were phased out in favour of mailing services because costs and convenience appeared to favour the latter. Maine offers an example.[196] In many cases, the mail service was offered to all patrons, regardless of their ability to get to the library.

By 1975, 120 public libraries in the United States were offering a books by mail library service and nearly all of these were less than three years old. Canada had perhaps half a dozen. Some of the earliest of these new services were Manitowoc County's *Mailbox Library* in Wisconsin, which began in 1970, and North Central Kansas Library's *Dial a Book*[197] service, which was started in 1968. The most successful is, probably, the North Central Regional Library Service in Wenatchee, Washington, which boasted circulation statistics of 145,999[198] in 1975. Canada's new BBM services developed in Ontario, Newfoundland and Saskatchewan during the 1970's.

All the mailing services established during the last decade were meant to be permanent, rather than stop gap measures. They may represent the first uncertain movement of the public library toward direct delivery of library materials. The services are, however, still rooted in the industrial era, relying, in most cases, on written requests, offering a recreational reading service and using the national mail for delivery of materials. They are well placed, however, to respond to the pressures that will be generated by the new technological developments.

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[195] Robert T. Jordan, *Tomorrow's Library: Direct Access and Delivery* (New York: R.R. Bowker, 1970).
[196] "Maine Halts Bookmobiles: Substitutes Books By Mail," *American Libraries*, Vol 12, No 8 (September, 1981), p. 458.
[197] Kim, op. cit., p. 175.
[198] Ibid., p. 193.

To launch the new services, the majority of libraries circulated copies of their catalogues and a number of request cards to all households within their service areas. Those people who were interested returned the cards and the new services were started. They usually relied on very small staff allocations and had very limited budgets.

In most cases, the book collection was purchased especially for the new service. It usually consisted of 1000 to 3000 paperback editions, and included multiple copies of popular titles. In a few cases, a library's existing collection was used, but the trend was away from hard-cover books, for the sake of saving postage costs.

Once residents were made aware of the service, they were expected to telephone or send in a request card, every time they wanted books. In no case were books sent automatically, as parcels were returned. As a consequence, the new services tended to grow slowly, but steadily, and survived their first few years without the need for major staff or budget increases.

C. Advantages and Disadvantages of BBM Library Services

Advantages

BBM libraries are able to provide a highly personalised service. In spite of the fact that individual readers may be seen only rarely, if ever, it is possible to cater to their particular interests and needs, much more specifically than other libraries are normally able to do. If a reader asks for books or information on a particular subject, the library staff can ensure that the materials sent are relevant and adequate. Written or telephone communication allows clarification of particular requests or explanations of the methods used to select materials, if this becomes necessary.

A further advantage, from the reader's viewpoint, is the fact that no effort is necessary, beyond making the original request. The reader is thus saved time, effort and probably, considerable frustration, if the information required is abstruse. On the other hand, the reader does not have the opportunity to browse the shelves, indexes or vertical files.

As a consequence of this ability to provide personalised service, the BBM library's readers tend to be very appreciative of its efforts. These libraries are rarely faced with 'problem' patrons in the usual sense of the term. Patrons occasionally ask for more

materials, in a very specific area, than the library can provide, and some are slow to return books but by far the greatest number are grateful for the service, lavish in their praises and overwhelmed when a particular effort is made by the library staff, on their behalf.

A BBM library has no need of electronic security systems. Very few books are lost. Circulation control procedures ensure that the library has records of all materials on loan to patrons. Occasionally, a parcel of books is lost in the mail or a reader will explain that loss or damage to a book results from some accident at home. If a reader fails to return books and offers no explanation, service can be halted until the problem is resolved.

Disadvantages

BBM libraries are inclined to be labour intensive, especially if a continuous service is provided. The patron does nothing for himself but provide a list of requested titles. Library staff must find the materials, ensure that a variety is sent, that requests have not been unintentionally duplicated by substitutions, and that all information requests have been filled. Materials must then be charged out, packaged and mailed. Unpacking, discharging and re-shelving returned books is also time consuming.

Another problem is multiple requests for the same title. If a title becomes unexpectedly popular, many readers may be kept waiting unless a library can purchase multiple, paperback copies of the desired item. Even then, once all copies are in circulation, people still desiring to receive the item, may be kept waiting for two or three weeks because of the long loan period that mailing libraries are obliged to grant.

A surprisingly minor problem for BBM libraries is the barrier that distance creates in allowing the library staff to know the community they are serving. The libraries' patrons help to minimise this problem. They write to request new books, extensions of the due date or to inquire about delayed parcels and, at the same time, provide considerable incidental information about themselves and their communities. They mention family joys and sorrows, local problems, and special interests and opinions. Consequently, BBM libraries are, in fact, usually well informed about their communities.

It is almost impossible for a BBM library to provide adequate library service, if it must stand alone. Even if a library had a large collection, without the support of a parent

institution, service would be limited to the provision of reading material. As noted, most BBM libraries do not purchase periodicals or reference materials, such as encyclopedias and handbooks. Circulation of these items presents major difficulties. To accumulate expensive materials for internal use only, would be hard to justify, financially. Attachment to a public or academic library allows occasional use of reference materials, indexes, periodicals, government documents, etc. Both the mailing and the parent library gain by this sharing. Use of the materials helps justify purchase for the parent institution and it allows the mailing library to provide the full library service to which its patrons are entitled.

D. New Influences on the BBM Library

The books by mail library is ideally situated to take advantage of the computer/telecommunications innovations that are currently in process of development. It has the initial advantage that both institution and patrons are used to dealing with each other, over distance. To change from transmission of messages by letter or telephone, to electronic transmission of information by such means as *Telidon*, microcomputer or teleconferencing should be a fairly natural step for the clientele of a BBM library, provided that the new means of communication is simple to operate and cheap. In addition, there are obvious economies and efficiencies that improved communications and information handling might be expected to achieve for a mailing service. Both the library and its patrons would be delighted to reduce the amount of written correspondence.

Aged, disabled or rural residents (the typical clientele of the mailing library) may tend to be more conservative than their younger, able-bodied or urban counterparts. Consequently, application of the new technologies may be difficult for these libraries to establish. However, rural residents have acquired telephones and colour television sets, which were also once considered to be unnecessary, 'new-fangled gadgets.' As a consequence of the acquisiton of these items, they are much less isolated than formerly, and so, hardly less influenced by new developments. In any case, the convenience of instantaneous communication is likely to overcome initial, conservative reactions fairly quickly.

Direct Technological Influences on the BBM Library

Direct influences of the new technologies on the BBM library have resulted in the comparatively new abilities a) to provide computer searches for citations to answer information requests and b) to automate various internal functions.

Computer networks are already having a direct effect on all libraries. The ability to access remote data bases, to acquire lists of citations, is a useful but expensive asset. It can be expected, however, that communications costs will decrease as fibre optics and satellites come into greater use and that computer capacities will increase. Consequently, much greater use of these facilities can be expected, in the future. Data bases are no longer limited to the storage of citations. There are already many vendors who offer other services. Some are of particular interest to librarians, in that they include full text information. QL and Info Globe are examples. Full text listings of periodicals, reference handbooks and encyclopedias, etc. are likely to be developed.

Apart from the provision of reference services that involve data base searches, very little can be accomplished by any library, regarding use of the new communications systems, until internal functions have been automated, particularly the catalogue, circulation and acquisitions. Automation of these functions will enable libraries to increase speed of acquisition, processing and, in the case of the books by mail library, document delivery. This efficiency should reduce staff requirements and, therefore, library costs should also, eventually, be decreased.

For the books by mail service which is a department within a major library, automation will occur as a result of the work of the main system. Although major economies and efficiencies are to be hoped for, there is little that the department itself can do except ensure that its special requirements are taken into account when the master plan is prepared, and co-operate in its implementation.

For those that are independent, either entirely or within an institution, methods and means of accomplishing the automation of internal functions will vary. Each particular situation will present its own special possibilities and problems.

For some BBM libraries, the acquisition of a microcomputer might be a judicious use of funds. These machines can handle some internal routines, such as booklist production, using currently existing programmes, and can already be used to access

distant data bases. More complex functions, such as circulation, may have to await the production of commercially available software.

Where a BBM library is able to use the parent institution's computing facilities, purchase of a microcomputer would be more difficult to justify, in spite of the advantages inherent in being independent of a major system. Consequently, it is unlikely to be acquired until technological developments allow local storage of reference materials, probably on videodiscs. A microcomputer and printer would then be needed to access the data base and provide hard copies of materials retrieved. Blair discusses the possibility of direct public access to a library's data base via a home terminal[199] but for a books by mail library, serving a distant clientele, such an arrangement is unlikely to be popular, at least until telecommunications costs are reduced.

Indirect Influences on the BBM Library: Technological

Cable Television

A technology whose effect on the books by mail library is likely to be subtle but strong, is the introduction of two-way cable television. The most sophisticated service of this type currently in existence, is Warner's Qube system.[200] The CRTC has recently licensed six cable companies to provide pay television services in Canada, some of which may be expected to attempt to emulate *Qube*. As one of the recipients is located in Alberta, it is likely that two-way cable television will become available in this province in the near future.

Pay television is likely to have numerous effects on libraries. General interest programming and continuing education, offered through this medium as a form of distance education, should increase library use but more subtle influences might also be expected. A population that uses the two-way cable service will become used to communicating with a computer. Pressing a button, to indicate an answer or offer an opinion, will provide a small step toward transition into the electronic age. Those who habitually respond to the host computer owned by a cable company, will not feel inhibited in accessing other computer data bases, provided that the procedure is simple and costs are low. This development may encourage the use of on-line catalogues in libraries and patron access to library catalogues and other data bases from home.

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[199] Blair, op. cit., p. 14.
[200] See Chapter 5, p. 37.

The BBM library might also obtain access to one of the community programming channels to advertise its services, explain how to access its catalogue or become involved in programming. This has been done by some American libraries.[201] However, the last of these suggestions is a fairly extravagant use of staff time.

The last, major effect of pay television, on all libraries, is that it will provide competition for people's leisure time. The effect of this, or of competition from other media, such as videotape recorders, videodisc players and electronic games, on library use, is not yet known.

Telidon

Telidon, Canadian videotex, will apparently offer similar services, except that, because it can use the telephone network, it will provide a medium for electronic mail. At present, Telidon appears to be less advanced than pay television. It may, therefore, be some time before its effects are felt. What is more, these may be relatively weak, if pay television has already established many of the services it can supply.

Telidon will, however, allow interaction, for the sophisticated user, with data bases located in other than the host computer. Several effects of this phenomenon can be foreseen for BBM libraries. Individuals, who presently rely on libraries to provide them with information, will be able to access a data base from home. If they own such facilities as a keyboard and printer, they will be able to obtain copies of the information retrieved. Once a distant data base has been accessed and a list of citations obtained, a local, or books by mail library could be asked, perhaps by electronic mail, to provide copies of items desired or to accept orders for books to be delivered.

The foregoing also assumes that library users will be willing and able to do their own searches. There is no doubt that some will learn to be independent, but it is highly probable that many will prefer to leave the intricacies of data base searching to the professionals, whether the complications, presently involved in this activity, have been resolved or not. Requests for information would then be sent to the books by mail library by letter or telephone as now or, eventually, by electronic mail.

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[201] Lynne E. Bradley, "Cable TV and Libraries," *Telecommunications and Libraries: a Primer for Librarians and Information Managers*, (White Plains, N.Y.: Knowledge Industry Publications, Inc., 1981), p. 41.

It has been forecast that, by 1985, there will be more microcomputers than videotex terminals in Canadian homes.[202] These machines, apart from their word-processing and mathematical capabilities, when used in conjunction with a telephone modem, can be used as a communications medium. Once microcomputers become a popular consumer item, it can be safely assumed that, if the telecommunications companies have not already eliminated the incompatibility problem, those selling information from data bases will ensure that interfaces exist within their systems, that will allow the most popular microcomputer models to access their services. Consequently, microcomputer and Telidon terminal owners will have similar search capabilities

Teleconferencing

Teleconferencing of various types should have a strong impact on books by mail libraries because of its ability to provide recreational and educational opportunities, to residents of even, the most remote areas. These people can be expected to desire materials and information to support their interests once opportunities for increased involvement are made available. It is also notable that various futurists have suggested that there will be a trend for the population to move away from the densely populated areas as advanced communications networks obviate the need to live in the vicinity of the city for the sake of its conveniences. Consequently, teleconferencing is likely to continue to grow in importance and provoke increased use of books by mail library facilities.

Electronic Mail

If electronic mail becomes generally available, as seems probable, national mailing services may not survive in their present form. Although there will be a need for delivery of packages and parcels, loss of letter carrying services would reduce revenue so greatly, that parcel delivery would, presumably, become very expensive. BBM libraries could not afford to pay high parcel postage rates. This factor may have serious adverse effects on BBM libraries.

Reduction of the Use of Print

Another effect of the technological revolution that will affect books by mail libraries is the gradual reduction of the use of print. At some point during the transition

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[202] Canada. Royal Commission. *Royal Commission on Newspapers* (Ottawa: Supply and Services, 1981), p. 206.

period between the availability and elimination of printed indexes, all libraries will be forced to provide terminals so that distant data bases can be searched. It is to be hoped that, by the time this occurs, the needs for special training and special terminals, for each system of data bases, will have been eliminated by such advances as iNET and AT&T's Advanced Communication System. It is also to be hoped that a standard set of search commands will have been made possible. The Alberta Research Council's ACES system provides a step toward this.

Just as data bases are likely to replace printed indexes, new data bases are being developed which may eventually replace reference handbooks and encyclopedias. *Books in Print, American Men and Women of Science* and Ulrich's *International Periodical Directory* are already accessible, electronically.[203] It seems probable, however, that electronic storage of anything beyond quick reference materials will have to await the development of local storage techniques. At present, telecommunications costs involved in transmitting lengthy, textual materials, over long distances, are prohibitive. It is notable, however, that the *American Academic Encyclopedia* is now available on videodisc. This may mark the beginning of local, electronic, information storage.

Effects on Publishers

The effects of the electronic communications and computer revolution on publishing will have an indirect effect, not only on BBM libraries, but on all libraries. As noted earlier, certain materials presently printed are likely to cease to be available in that medium, as publishers find that markets do not warrant continued production. However, if publishers gradually withdraw from the publication of other forms of printed material, such as hard cover books, all libraries may be forced to become virtual information centres, rather more rapidly than is generally contemplated.

Indirect Influences on the BBM Library: Sociological

The sociological effects of the new computer communications developments include reduced employment, increased leisure and an increased interest in adult education, as noted in Chapter 7.

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[203] F.W. Lancaster, "The Future of the Library in the Age of Telecommunications," *Telecommunications and Libraries* (White Plains, N.Y.: Knowledge Industry Publications, Inc., 1981), p. 142.

Reduced Employment Opportunities

For the BBM library, reduced employment, as the underlying cause of the other two effects, may be considered from the point of view of its influence on manual, unskilled workers, on clerical and office employees and on managerial and professional groups.

So far as libraries are concerned, unskilled workers, although likely to be most immediately affected by automation, are unlikely to turn *en masse* to books and libraries, for a means of filling their leisure time. In view of the fact that most BBM libraries serve rural areas, it is unlikely that unskilled labour accounts for a large percentage of their clientele.

The second group, mainly female, retail and clerical employees, whose employment opportunities are likely to be strongly, adversely affected by the influence of automation, are more likely to turn to libraries for leisure activities, when work outside the home is no longer available. The library has long provided the housewife with a means of escape from the drudgery and boredom of her lot. Experience shows that women are avid readers of fiction and biographical works as well as books related to home centered tasks. For the books by mail library, service to this group presents no difficulty. It represents a continuation, perhaps expansion, of present services.

The professional and managerial groups, while unlikely to be immediately affected by reduced employment opportunities, will expect to enjoy increased leisure, once it becomes apparent that others have similar privileges. This is the group that is most likely to make strong demands on libraries, as increasing involvement in hobbies or educational endeavours becomes possible.

Leisure

There is little doubt that leisure will increase as work becomes scarcer. How much of this time will be used for recreational reading is not clear. There will be many potential uses of leisure so that, although it seems reasonable to assume that leisure reading will increase, competition from other pleasurable activities is likely to temper the increase in library use, that might otherwise be expected.

Adult Education

It is probable, however, that many individuals from all groups displaced by automation, as well as an increasing number of those who reach retirement but are still mentally alert, will renew their interest in education as a means of introducing meaning into what might, otherwise, become an empty life. Some will do so for other reasons but, regardless of motivation, it is expected that the number of adults engaged in educational activities will continue to increase.

E. Conclusion

As can be seen, the electronic information revolution will solve some of the books by mail library's problems and generate others. Internal automation should allow reductions in staffing while encouraging improved service. Information requests should be answered more rapidly and may, eventually, be handled entirely electronically. Electronics will not resolve the problem of multiple requests for the same title, at least for the foreseeable future, and the library will continue to rely on regular mail services for delivery of books and information. Neither will the new technologies help the library staff to know their community of users better. The potential number of contacts may actually be reduced.

The new technologies will tend to reduce the importance and use of some aspects of the BBM library's services and increase others. As greater variety of entertainment choices becomes available, leisure reading may become less desirable. However, as increased leisure allows people to spend more time on hobbies, special interests and educational projects, greater demands may be expected for supporting materials and information. The latter effect will be exaggerated for the BBM library, by the growth of distance education opportunities.

The BBM library's greatest risk is that national mailing services will be forced to increase parcel postage costs as the letter carrying business is reduced, and so leave it unable to provide a delivery service for hard copy materials, before electronic transmission of full text has negated the adverse effects of this happening.

The BBM library's greatest asset is the convenience which it can provide for its patrons. The new technologies should increase this asset in that information will be

obtainable more quickly and efficiently, presumably, without increasing library costs.

Other libraries will also gain this advantage as the communications revolution forces changes in methods of service and library functions. Consequently, in the final analysis, there will be so little difference between books by mail and other libraries, that they will become indistinguishable from each other.

Notes on Chapter 9.

The following sources of information were of particular usefulness in preparing this chapter.

Jordan, Robert T. *Tomorrow's Library: Direct Access and Delivery.* New York: R.R. Bowker, 1970.

Kim, Choong H. *Books by Mail: a Handbook for Libraries.* Westport, Conn.: Greenwood Press, 1977.

Telecommunications and Libraries: a Primer for Librarians and Information Managers. White Plains, New York: Knowledge Industry Publications, Inc., 1981.

X. The Extension Library, University of Alberta

A. Profile of the Extension Library

The University of Alberta's Extension Library is one of the Province's oldest, best used and most appreciated institutions. It has been serving Alberta for most of the twentieth century. The Library was founded in 1913, and was the brainchild of Dr. Henry Marshall Tory, the first President of the University. Dr. Tory believed that a fledgling university, in a pioneer area, was duty bound to extend its resources to all the people of the Province. The Extension Library was an obvious means of furthering this aim.[204]

The library began with 1000 books and a budget of $600. The books were divided into parcels of thirty or forty and packaged in heavy, grey, wooden boxes to be sent as travelling libraries to any settlement, in the Province of Alberta, which requested one. The service was very popular but it became apparent that a more personal library was wanted by Albertans. In 1915, the Open Shelf Library was started and this soon outstripped the travelling libraries in popularity.

The travelling libraries have now ceased to be a major component of the library's service although they have not entirely disappeared. Blocks of twenty books on a particular subject are still sent to community groups and clubs, but they now account for less than five per cent of the library's circulation. The Open Shelf service continues to flourish.

The Principle Service

Today, the largest part of the library's service is to isolated families in rural Alberta. Although the library does very little advertising, requests for membership are received daily. Presumably, readers tell their friends about the library and so the knowledge spreads. When an inquiry is received, information about the service and an application form are sent by return mail. Books are sent as soon as the completed application form has been received in the library.

Readers may request from one to eight books in each parcel and may receive one or two parcels per month. Alternatively, they may state that they wish to receive books only occasionally, and will write each time they want them. Otherwise, books are sent to a

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[204] Information in this section has been extracted from my article in *Folio/New Trail*, Vol 18, No 7 (August 1981), p. 2.

reader as soon as he returns those he has read. Readers do not need to write every time they want books, provided that they have given the library a list of titles that they wish to receive or a list of their interests (so that books can be selected for them). The library now serves approximately 12,000 individuals and circulates approximately 170,000 books per year.[205]

In deference to the principle that information should be free, there is no charge for membership in the library and postage is pre-paid. Books are sent by regular mail at the special library rate.

In order to provide readers with as close an approximation of normal library service as possible, the library produces and makes available, copies of its catalogue and booklists. The catalogue is divided into twelve sections and readers select those which are of interest to them. There are also over 200 booklists from which they may choose on subjects ranging from *Aviation* to *Women's New Role*.

Other Services

The library's services are not restricted to those already mentioned. A reference and information service is available to the library's members. Information is sought by the library's users on a wide variety of topics. These range from materials for continuing education projects, to help with personal and family related problems; from wilderness survival information to material for a new novel. High school students frequently request information to support educational projects.

The most important of the library's secondary services results from cooperation among the Faculty of Extension, the University Library and Libraries Division of Alberta Culture. This is the inter-library loan service. The Extension Library receives requests from other libraries throughout Alberta for materials wanted by their patrons but which they do not own. Extension Library staff search the library's own collection, and if unable to find the desired material, search in the University Library. The latter allows a special long loan period for these items. The library handles approximately 11,000 requests of this nature per year.

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[205] University of Alberta, Faculty of Extension. *Annual Report 1980 - 1981: Activities of the Faculty of Extension at the University of Alberta for the Year Ending March 31, 1981* (Edmonton: March 1981), p. 83.

In 1976, the library instituted its service to fire towers. A letter was sent to the Forestry School at Hinton, offering library service to fire tower personnel. The offer was siezed upon with delight, and the service to the fire towers is now flourishing. Special arrangements are made regarding overdue books because of the limitations imposed by the dependence of these readers on occasional, helicopter service.

Another service, started in 1977, was that to Alberta penitentiaries. Books by mail simplifies security procedures and parcels can be sent back and forth without frisking personnel or wasting time and energy on endless checking. Although the demand for fiction is strong, many inmates ask for scholarly materials.

Two other services have been introduced. In 1980, the Faculty of Education requested assistance in the provision of learning resource materials to students doing their teaching practicum in areas outside Edmonton. The assistance was provided but the service was not requested beyond that particular semester. The library has also begun to provide texts and resource materials to teachers of English as a Second Language. Alberta Advanced Education and Manpower provided the materials, and the library received its first request for service in April, 1981.

No library's service would be considered complete whose materials were restricted to the English language. The Extension Library's major collection is in English, but it has a small collection of French materials, and has, at various times, borrowed materials in Ukrainian, German, Hungarian, Chinese and Spanish from Alberta Culture's Multi-Lingual Biblio Service, for circulation to its readers.

B. Immediate Influence of the New Technologies

The Extension Library is unique. It is independent of the main University Library, having its own staff, space, budget and collection but like any other department, it has access to the University's facilities, including its computing services.

The library is now in the process of automating its booklists and catalogues. For many years, these were updated by hand: a long and expensive process. Some years ago, a very abbreviated catalogue was entered into the University's computer system. This allowed additions and deletions to be made without retyping the whole. A simple file maintenance programme was used. However, this very simple system was soon found to

be too limited for the library's needs.

A system was needed that would allow for searching by author, title or subject, that would allow for the production of lists of titles according to broad subject categories and that could accommodate both acquisition and circulation functions at a later date. A secondary requirement was that the data base could be re-formatted later, if necessary, to allow for possible merging with the University Library's catalogue which will eventually be under the control of the DOBIS/LIBIS management system. It was felt that maximum co-operation should always remain possible.

Eventually, the decision was made to transfer the whole catalogue to SPIRES (Stanford Public Information Retrieval System). This data base management system has many advantages. It is supported at the University of Alberta, is always operational, is easy to use and there is a SPIRES users group, which meets two or three times a year. This allows a sharing of common problems and new ideas. The system is not only ideally suited to quick searches but is able to accommodate the above noted requirements. It is also excellent for the Extension Library's primary purpose of increasing request retrieval speed. However, even if such an advantageous system had not been available, it is doubtful whether the library could have chosen to follow any path, other than one that could be accommodated by programmes already in the University of Alberta's possession. Limited budgets and a lack of expertise within the Extension Library would have inhibited more adventurous schemes.

Automation of Internal Functions

When automation of the catalogue and of the acquisitions functions have been completed, major improvements in the library's performance should be possible. The obvious efficiencies are, as with any library, reduction of typing, filing and other paper work. For the Extension Library, another major advantage will be that the library staff, searching for books requested by patrons, will be able to run searches on the data base to confirm authors, titles, call numbers and even ownership, of the books requested, much more rapidly than is presently the case.

The first step, automation of the catalogue, is the slowest and the most painstaking of the automation procedures. Nothing can be done that will speed the library's service until this step has been completed. Greater speed can be expected in the

implementation of the circulation system.

The advantages of an automated circulation system are well documented in the literature. For the books by mail library, the ability to retrieve information concerning a book's status is of particular value. Staff will no longer waste time searching the shelves for material that is on loan, at the bindery or lost.

The automation of internal functions represents the completion of the first stage of computerisation. It should reduce paperwork, increase output and, at the same time, reduce the labour required to produce the service. It should also leave the library ready to contend with whatever exigencies develop out of the telecommunications/computer revolution.

C. Future Influences of the New Technologies

Future influences of the new technologies on the Extension Library may be considered in relation to specific services.

The Basic Service

This service may be expected to be affected by internal automation and by the advent of electronic mail. Although it will still be necessary to send books and periodical articles in hard copy format, for many years to come, the internal automation should improve efficiency of the service. However, the method of correspondence between the library and its patrons may change. At present, most of this is written, but once Telidon or microcomputers become widely used, requests for materials, or other messages, may reach the library via electronic mail. Use of electronic mail could make the service far more immediate and personal.

The possibility of the demise of print seems, at this point, to be sufficiently distant as not to require probing in relation to the Extension Library's book service at this time.

Inter-library Loan and Reference Services

These aspects of the library's services may be affected by the new technologies in several ways. The existence of computer networks has not yet impinged on the library's working procedures. However, as indexes and reference materials cease to be available in print, access to these materials will be needed. Staff training and budget

adjustments will them become necessary.

It is probable that electronic mail will also influence this service. Readers having access to Telidon terminals or microcomputers could send requests to the library by this means and, in certain circumstances, the library could respond by the same means. Inter-library loan requests might also be sent and received electronically.

Telefacsimile transmission may also, eventually, become a part of the library's inter-library loan system. Although costs are presently too high and a network, with compatible machinery or, at least, adequate interfaces would be needed, the fact that this particular technology is being developed so rapidly, leads to the probability of its eventual use as a means of transmitting hard copies of documents between libraries.

Another advance in automation, that may affect the reference and inter-library loan functions of the Extension Library, is most probably that deriving from the use of videodiscs, for internal storage. If it becomes possible to store periodical literature on videodiscs and to access specific items using a microcomputer, the library would be able to offer a far more efficient reference service than is presently the case. The possibility also exists that readers could eventually access the videodisc data base independently, by using their own Telidon terminal or microcomputer.

This last is the most questionable of the suggestions for future development, made for the Extension Library. Videodiscs can carry sufficient quantities of information to be used for the purposes suggested, but present cathode ray tube screens cannot display an adequate quantity of text. Although various local storage videodisc system prototypes have been developed, many questions remain unanswered. At present, it is not known, for example, who will produce these videodiscs or what the price will be.

Fire Towers and Penitentiaries

The fire tower and penitentiary services are least likely to be affected by the new technologies because recipients of both services are isolated and so are unlikely to have access to the new communication systems.

D. Adult Education and the Extension Library

The Extension Library can expect to be affected to a greater extent than its sister institutions, by the application of such services as cable television, teleconferencing and *Telidon,* to adult education. All of these devices are able to offer interactive services and so it can be expected that institutions, such as the University of Alberta, which offer educational courses for adults, will recognise the potential of the new media and steadily increase their use of them. It can be expected that the number, as well as the variety, of courses available will increase as satellite transmission, optical fibre and other media for transmission of information become viable. Although teachers will provide information packages of various sorts, recourse to the library should be a necessity, for anyone studying for interest, rather than from compulsion. Presumably, distance education students enrolled in other institutions will also need library service. However, service to these individuals, by the Extension Library, would necessitate agreements between the University of Alberta and other institutions involved.

E. A Possible Change in Direction for the Extension Library

The Province of Alberta has begun to develop regional libraries, at least one of which, the Marigold Regional Library, is attempting to operate its own books by mail service. Consequently, the need for the indefinite continuation of the Extension Library's role as a public service, to the rural residents of Alberta, appears to be diminishing. When this is viewed in conjunction with the potentially huge increase in interest in continuing education, a change of direction for the Extension Library, seems worthy of consideration.

The change of direction envisioned involves a gradual withdrawal of public library service and the compensating gradual development of library services for distance education students. As Alberta's regional library systems become established and begin to provide library services to the remote farms and villages in their areas, the Extension Library's service will become redundant. On the other hand, as a steadily increasing number of students choose to take courses from the University of Alberta, from a distance, a need will develop to provide these individuals with access to library materials. The Extension Library could provide appropriate services.

Such a change of service, involving a change in clientele, would have far reaching consequences, both internal and external. For example, the library would need much closer ties, not only with the University Library but with the faculties as well. Links with Libraries Division of Alberta Culture may diminish in importance, and present inter-library loan arrangements may, eventually, need review. Internal changes would affect all aspects of the library: its staff, collection development policies, methods of providing service, etc.

Such a change would involve so great a restructuring of the library, that it could be expected to take several years to accomplish. This, however, should not be a major problem. It would allow a gradual reduction of present services so as to avoid arousing public animosity against the University, and time for the growth and development of the new, distance education services. The Extension Library would also have time for a gradual accommodation of the needs of these new services.

If it is assumed that this direction will be taken, it can be expected that the library will continue to automate its internal functions, to maintain its data base and eventually make this public. It is also likely that there will be a greater emphasis on the provision of packaged information. This implies more than merely supplying a specific title or item requested but selection and delivery of materials to answer a general request for information on a particular topic. This might involve consultation with faculty members offering the distance education courses. A service of this sort would be less alien to the Extension Library than to other libraries which limit their reference services to showing a patron how to find desired materials. Mailing libraries have always had to provide the information itself, so that such a development would merely reflect an increase in the growth and importance of an existing service.

In light of present and probable future technological developments, the Extension Library is likely to share the fate of other libraries in that major changes in service and function are to be expected. Because of the library's special circumstances, however, the changes it faces are likely to be even more far reaching. Nevertheless, the library has much to gain by the stream-lining of its activities, made possible by the electronic information revolution. It will make its catalogue public, continue to provide informational, educational, recreational and leisure reading, as long as this is necessary and economically

viable but it will presumably, eventually, provide a far more sophisticated reference and information service than is presently feasible.

F. Conclusion

The Extension Library at the University of Alberta appears to be approaching a major transformation. Its usefulness as a public service may be becoming more limited as the public library services within the Province become regionalised and consequently, more effective. Fortunately, a new challenge beckons. As the technological developments produce new social needs, the Extension Library may be offered a fresh and exciting opportunity.

A change in service emphasis would not be a simple thing to achieve. It would require careful and complex planning and input from many sectors. It would involve new policies, new kinds of service and a new and different clientele. All of these things would take time, tact and patience to accomplish. However, with a mailing service in place, distance education students would acquire the same advantages as their colleagues on campus. The University of Alberta would be able to step into the future with confidence that it is not only providing its students with valuable information and research services but that, all are being given equal opportunities for learning.

Notes on Chapter 10

Further information about the Extension Library can be obtained from the following sources:

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XI. Conclusion

History of the Technology

The study has shown that technological developments and their applications have been occurring at a steadily increasing speed. The slow process of invention and application, typical of the eighteenth and nineteenth centuries, has gradually gained momentum and is now achieving a frenetic pace. Proof of this can be seen in a review of a few of the developments that have taken place, during the time that this study has been under review (from January 1981 to May 1982). For example: microcomputer manufacturers have begun to advertise hard discs for their machines, videodisc players have appeared in Edmonton department stores, Alberta schools have begun to receive two-way educational television programmes via satellite, and several have acquired microcomputers for student use, earth stations have begun to be advertised as consumer items and the space shuttle, *Columbia*, has made three voyages into space. This is not a comprehensive list but it is indicative of the pace at which technology is forcing change to occur.

The Computer

The study showed that the full potential of the computer has not yet been achieved. Artificial intelligence researchers suggest that even assumptions concerning computer limitations that are commonly accepted, are erroneous. Minsky states that the stereotype that programmes, in general, are straight forward and intelligible is, "an obsolete conception inherited from an earlier notion of what a computer is." [206]

The mainframe, general purpose computer has allowed large libraries to automate internal functions and the microcomputer is about to make similar advances possible for small libraries. Decreasing costs, increasing storage capacities and improved efficiency imply that it is only a matter of time before all libraries will be able to automate internal functions and access distant data bases for information. Consequently, even small libraries have the potential to become major information centres.

The New Communications Systems

Some applications of the new technologies that were noted, included computer networks, teleconferencing, cable television and videotex systems. It was recognised that

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[206] Minsky, op. cit., p. 395.

the capacities of all of these would be enhanced by the development and application of such new technologies as optical fibre, laser beam transmission and satellites.

Computer networks are already affecting library functions but it can be expected that their influence will increase as fibre optic cabling becomes commonplace and improvements are made to the computer itself.

Telidon and the microcomputer were seen to share certain characteristics which will encourage the use of electronic mail. It was also noted that, because of their ability to accommodate electronic funds transfer and catalogue shopping, Telidon and cable television will encourage library patrons to expect the same degree of convenience from their libraries.

Teleconferencing systems are likely to have the greatest effect on BBM libraries because both services contact people from a distance. Teleconferencing will provide the same educational and recreational opportunities, to isolated individuals, as are available to city dwellers. It was noted that this technology offers major advantages, particularly to business and to education.

Social and Psychological Factors

Some time was spent on the social and psychological factors affecting application of the new technologies. It was suggested that certain factors will delay application but that they were unlikely to prevent technological advance. The increase in leisure as a result of reduced work opportunities was noted, as was the commercial response to this potential market for entertainment, and the effects of this response in providing competition for people's leisure time. It will be possible for people to select their entertainment from a wide spectrum of choices. This will increase the attractiveness of home entertainment and may reduce the need for recreational reading materials. On the other hand, the availability of educational packages should encourage students (whether adult or otherwise) to delve more deeply into a particular subject of study and so make more use of library services.

It was recognised that forecast changes such as Toffler's electronic cottage, the reduction in the importance of work and the availability of sophisticated communications systems, will, if they occur at all, take time to accomplish. Some areas of the economy, some institutions and some people will be more sensitive to change than others and some

will offer greater resistance. Consequently, change will not occur in a neat and clearly visible pattern and the need to keep aware of trends, in order to take advantage of opportunities offered by the new developments, will remain important.

Library Reactions

Libraries, because they have limited budgets, will presumably, look for the cheapest and most efficient ways to provide service. It has been suggested that many will evolve into virtual information systems. Others may review and re-state their basic policies and decide to maintain print and non-print collections, allowing complex information needs to be filled by other agencies. As long as it is possible to do so, most libraries will attempt to maintain both functions, but budgetry considerations may prevent them from doing so, indefinitely.

In these respects, the books by mail library is no different from its sister institutions. However, it may be forced into the information provider role more quickly than other libraries, if national postal services falter as a result of the growth of electronic mail systems.

The Extension Library

The Extension Library has been seen as an unique service which is subject, not only to the effects of the changes caused by the the new technologies, but also by those arising out of its political situation. It has been demonstrated, however, that the two sets of influences could be brought together for the benefit of the University of Alberta, its students and the library, itself.

Conclusion

Books by mail libraries will tend to lose their uniqueness as the new communications systems allow them to increase and improve services and as other libraries begin to feel the pressure to provide document delivery services. In the meantime, the Extension Library will continue to provide library services to those rural Albertans who require them and may begin to move toward a greater involvement with adult continuing education.

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